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ORIGINAL MEMOIRS.

AN ANALYTICAL AND STATISTICAL REVIEW OF ONE THOUSAND CASES OF HEAD INJURY.

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THE analysis of so large a number of complicated cases of head injury is necessarily prolix, but can hardly fail to have interest and value to those who study cranial and intracranial injuries. It will serve as a supplement to an earlier work ("Traumatic Injuries of the Brain and its Membranes," Phelps, 1897-1902), and will practically corroborate the general statements made at that time.

The cases cited are limited now, as they were then, to those personally observed; and all inferences, conclusions, and statements of fact are based exclusively upon that observation. Extracranial injuries other than fractures have not been noted, as with the advent of aseptic precautions they have ceased to be of practical importance except as aids in the diagnosis of intracranial lesions. Cutaneous wounds which through neglect have become infected are still readily amenable to local antiseptic treatment, even in the exceptional instances in which they are responsible for secondary intracranial inflammations.

Head injuries, as they will be considered, are most conveniently classified primarily as *fractures of the cranial vault*,

fractures of the cranial base, and independent injuries of the cranial contents. They most frequently complicate each other, and possibly in a majority of cases all these conditions are present together; but any one may exist practically by itself, and its separate existence may be recognizable and may determine prognosis and treatment.

SUMMARY OF CASES.

	Cases	Recoveries	Deaths	Necropsies
Fractures of cranial base....	570	259	311	203
Fractures of cranial vault...	213	152	61	46
Independent injuries without demonstrable fracture	217	130	87	63
Totals.....	1000	541	459	312

The class last mentioned includes cases in which the absence of fracture is assumed from the absence of characteristic symptoms; and as in many instances a fractured base has been discovered post mortem when no indications had existed during life, it doubtless includes a very considerable number of cases which were really cases of fracture.

It is perhaps the most notable feature of this table that the recoveries exceed the deaths in number; and that even with fractures that involve the cranial base, which were long supposed to be almost if not quite invariably fatal, the recoveries so nearly approximate the fatalities.

FRACTURES OF THE SKULL.—These may be as variously classified in accordance with their character and location as are those of the extremities; but their simple division into fractures of the vault and fractures of the base is distinctive and therefore the most convenient. Each of these grand divisions may be subdivided into simple, compound, depressed, punctured, and complicated, as are other fractures, and occur with varying degrees of frequency and importance as they affect one region or another.

It has been found in this collection of cases that the vast majority of fractures of the base originate in the vault, and are continuations of fissures, which, beginning at the point

upon which the impact of external violence was received, follow the line of least resistance into the corresponding basal fossa, where they terminate, or whence they extend into the adjacent or even into all the fossæ. They should be considered as fractures of the base rather than of the vault because it is from implication of that region that their characteristic conditions depend. Various theories explanatory of the extension of fractures from the vault to one region of the base rather than to another were noted in that earlier work (*lib. cit.*) to which reference has been made, and to which it will often be necessary to refer hereafter. The larger experience has suggested no modification of what was then said, and its repetition may be avoided as not essential to the present purpose.

Direct Fractures.—The whole number of cases in which with force transmitted from the vault the fracture was confined to the base, as verified by subsequent necropsy, was forty-six. In seven of these there was coincident but independent fracture of the vault, which sometimes involved the base in some distant region. It is not impossible that there were unrecognized direct fractures among cases which terminated in recovery, or in death without post-mortem examination, since of those discovered many did not contribute to the fatal result, and fully one-half were unaccompanied by symptoms indicative of fracture.

There were additionally cases of fracture of the base from force directly applied. These include eighteen of pistol-shot origin, a small number of perforations of the orbit with punctured wound, and three or possibly four in which orbital or ethmoid fracture was produced by great violence inflicted in the orbital or nasal region.

No history was obtainable in one-third of the cases in which fracture was limited to the base; in one-half the number the patients had fallen variable distances, as from the mizzen top into the hold of a vessel to a mere fall on the street or to the floor from a bench in a police station; in the remaining cases they were struck upon the head or knocked down by some

moving vehicle; and in two exceptional instances the head was forcibly flexed in the occipitomenal diameter upon an unyielding obstruction by a descending elevator.

Any one or more of the basal fossæ may be involved in a direct fracture, or it may be limited to the petrous portion. All the fossæ were included in two cases, and all but one anterior fossa in three others. The middle fossa was alone fractured in twenty cases, and was implicated in thirteen more. A single orbital plate, or the petrous portion, was sometimes the only part to be involved. So far as it was possible to determine the point or region upon which the force of impact had been exerted, its relation to the site of fracture was inconstant. It is not as obvious that the direct basal fracture was produced in the line of least resistance, as it seemingly was in the cases where fracture was prolonged from a point of impact upon the vault. In some instances in which a fracture limited to an orbital plate or to a sphenoid process followed a blow upon the eye, force must have been transmitted directly through the soft parts. In the larger number of cases fracture was produced indifferently upon the side of injury, or upon its opposite, or in any of the cranial diameters. In such case it becomes difficult to determine whether transmission was through the bone or through the cranial contents, as well as clinically unimportant. There were two instances in which force was transmitted from the feet through the body; but in one, which was fatal, there was no fracture.¹ The other, terminating in recovery, is of sufficient interest to quote in brief.

CASE I.—A man fell nine stories to the ground, striking upon his feet, his fall having been broken by several pieces of projecting timber. He was found sitting upon the ground, conscious, rational, and complaining of severe pain in his head; temperature 98.8°; pulse 60; respiration 15; free hemorrhage from his right ear. On admission to the hospital his general symptoms were unchanged. He was subsequently restless, irritable, and delirious,

¹ Phelps: Traumatic Injuries of the Brain and Its Membranes, Case CXCVI.

with temperature rising to 103° on the second day. Oozing from the ear continued till the fourth, and delirium till the sixth day. Vesical and rectal control was retained.

The intracranial complications which attend direct basal fractures do not differ from those which may occur when the fracture has its beginning in the vault, and like them they are usually concomitant rather than resultant. The exceptional instances were those in which the middle meningeal artery or a basal sinus was ruptured; and two in which a frontal lobe was lacerated by fragments of an orbital plate.

The subjoined cases are illustrative of this form of fracture.

CASE II.—Patient knocked down by a bicycle; right eye closed by hæmatoma; abrasions of head and face; comminution of corresponding orbital plate, with fissures; one fissure running upward into frontal bone, and two backward and respectively through opposite clinoid process and through corresponding greater sphenoid wing into petrous portion and finally into foramen lacerum posterius.

CASE III.—No history obtainable; contusion of both eyes; comminuted fracture of one orbital plate with displacement of fragments and fine fissures; one fissure ran through ethmoid and sphenoid bodies, one through middle fossa and along anterior petrous surface, and one through optic foramen.

CASE IV.—No history obtainable; hæmatoma of right orbit; transverse fracture of corresponding orbital plate.

CASE V.—Patient fell in the street. No external injury; separation of greater wing of sphenoid from squamous portion of temporal bone.

CASE VI.—Patient fell ten or fifteen feet through a hatchway; fissure through internal auditory meatus and into tip of greater wing of sphenoid bone.

CASE VII.—No history obtainable; wound in right occipital region; linear fracture running transversely across middle of right petrous portion.

CASE VIII.—No history obtainable; wound over occipital tuberosity; fine fissure confined to posterior petrous border.

CASE IX.—Patient jumped from fifth story window; two independent fissures, each limited to a petrous portion.

CASE X.—Patient fell one story; struck upon left side of head and body; scalp wound in left temporal region; fracture extending from outer part of anterior surface of right petrous portion through body of the sphenoid bone into its lesser wing.

CASE XI.—No history obtainable; occipital wound; fracture beginning at foramen magnum, and extending upward into opposite inferior posterior fossa.

CASE XII.—No history obtainable; fracture extending from anterior petrous surface to foramen spinosum, lacerating *arteria meningea media*.

CASE XIII.—Patient fell from his seat in a police station; two fractures of the vault, and one limited to the base running along whole length of anterior petrous surface.

CASE XIV.—Patient fell down one flight of stairs; fracture of both orbital plates, left greater wing of sphenoid bone, left petrous portion, and basilar process of occipital bone.

CASE XV.—Patient fell from the mizzen top into the hold of a vessel; fractures confined to the base; six fissures involving all the basal fossæ; one primary fissure began at the foramen magnum and formed five subdivisions, and a sixth was independent and confined to the crista galli and sella turcica.

CASE XVI.—Patient was struck upon the occiput by a descending elevator and his head forced forward upon a railing; fracture confined to anterior fossæ, and extending from posterior border of cribriform plate by a wide curve forward and outward, and then inward through both orbital plates to a corresponding point on the left side. The roof of each orbit was elevated and tilted forward, and the frontal sinuses were made continuous with the cranial cavity. The right frontal lobe was extensively lacerated by an orbital fragment.

SYMPTOMS AND DIAGNOSIS.

The symptomatology of cranial fracture has been much confused by a failure to distinguish the symptoms of the fracture itself from those of the intracranial complications which so frequently accompany it, and give to it a factitious importance. The abnormalities of pulse, temperature, and pupils—the loss of consciousness and other morbid conditions—which are still enumerated as symptoms of fracture,

indicate intracranial lesions which are only in rare instances even dependent upon the fracture which they accompany. They equally occur when no cranial injury has been sustained, and are then manifested by the same general indications. They result from a common cause, but are essentially independent of each other. It is only occasionally that an osseous fragment may rupture an important vessel or lacerate the cerebral substance.

The distinctions between symptoms of a fracture and those of the concomitant cerebral or meningeal lesions have more than an academic interest, since a well-defined conception of the significance of symptoms is essential to correctness of prognosis and treatment.

The direct symptoms are few, and not difficult to discover. Fractures confined to the vault are to be considered apart from those which primarily or secondarily involve the base. They are to be recognized by tactile or by visual sense, which are always practicable methods; and there is no justification for the neglect to resort to both when one is insufficient for exact diagnosis. If the fracture be compound there can be no doubt of its existence, provided the wound be of sufficient size to disclose the osseous surface. If the wound be too small for thorough exploration the fracture may be regarded as essentially of the simple variety. The simple fracture if depressed may often be recognized by palpation through the layers of the scalp; but if doubt exists, or if from symptoms of intracranial complication suspicion arises, certainty should be attained by incision and direct inspection. This covers the whole ground of diagnosis—tactile or visual examination—and if necessary to that purpose sufficient and unhesitating incision down to the cranial surface. It may happen that a fracture confined to the vault, or extended to the base, affords no local indication of injury having been sustained—neither wound, hæmatoma, nor contusion. There is then, in the absence of intracranial symptoms, no warrant for exploration; and it is fair to assume that if fracture exist it is immaterial.

The diagnosis of fractured base is sometimes incidentally made in the course of an exploration of the vault by establishment of the continuity of a fissure from one region into the other; this, however, is exceptional and likely to be confined to cases in which the vault is extensively comminuted, or in which search is being made for the source of an epidural hemorrhage.

Hemorrhage.—The one indication of basal fracture, and the only one upon which dependence can be placed in the great majority of cases, is a cranial or intracranial hemorrhage which through some channel becomes visible upon or beneath the surface. Its source may be the vessels of the diplöe, the meninges, or the brain; and its escape may be from the ear, nose, or mouth, or into the subconjunctival or subcutaneous tissue.

The absolute and comparative frequency of these several forms of hemorrhage is indicated in the following table.

	Recovered	Died	Total	Necropsies
Hemorrhage from the ear...	166	119	285	69
Hemorrhage from nose and mouth.....	39	51	90	32
Subconjunctival hemorrhage.	9	8	17	7
Subcutaneous hemorrhage {	mastoid	3	13	9
	cervical.....	0		
	orbital.....	0		
			405	

The hemorrhage from the ear is not only the most frequent, but also is the one of paramount importance. As a positive sign it may be considered pathognomonic of fracture of the petrous portion of the temporal bone involving the internal auditory passage and followed by rupture of the tympanum from pressure of extravasated blood. The single exception to this as an absolute rule was encountered in a case of gunshot wound inflicted at short range immediately in front of the ear, in which a slight hemorrhage was occasioned by rupture of the tympanum from concussion. In every other instance in which ruptured tympanum and hemorrhage oc-

curred, post-mortem examination showed a petrous fracture through the auditory canal, and in no instance in which hemorrhage from the ear had been absent was such a fracture disclosed. If a petrous fracture did not involve the internal auditory canal it would, of course, afford no outlet for the blood, which may come from either the osteal or meningeal or even from the cerebral vessels. The large number of cases observed would seem to warrant the conclusion that no extremity of violence otherwise inflicted upon the cranium can rupture the tympanum by concussion; and that the instances of such rupture from atmospheric disturbance or bullet impact are very exceptional.

In making this diagnosis care must be exercised in examining the external auditory meatus, as the cranial or intracranial hemorrhage is occasionally simulated by a hemorrhage into that passage from an external wound. There were nine such exceptional cases in the present series, in four of which the absence of fracture was further verified post mortem. In each instance blood had trickled into the meatus from some wound of the scalp or external ear, or had issued from some wound within the meatus itself; and in each it had been mistaken on primary and cursory examination for the usual indication of fracture. The necessity for this precautionary examination of the external parts for the source of an aural hemorrhage is so apparent that reference to it would seem supererogatory were it not that it is so generally neglected. The wound in the tympanum is not often visible after the hemorrhage has ceased because it is usually simple, and primary union is the rule; but the absence of any possible external source of hemorrhage is quite sufficient for diagnosis. The flow may be trivial or profuse; it may cease at once or be prolonged for days; but neither the quantity nor the duration of the flow is material.

The nasal and subconjunctival hemorrhages though often noted are much less frequently indicative of fracture. Their dependence upon local injury in many cases is evident, and their intracranial origin in many others is scarcely less open to

question; but their significance in perhaps a majority of cases is purely conjectural. It follows that their frequency as symptoms of cranial fracture cannot be stated with the positive certainty which was possible in cases of hemorrhage from the ear, and that their number as stated in the preceding tabulation must be regarded as only approximate.

If a subconjunctival hemorrhage appears at once, together with an orbital or palpebral ecchymosis, it is probably a part of the general local contusion; but if it appears only after an interval of several hours, or of one or more days, and without subcutaneous extravasation, it is fair to assume a fracture involving some part of the orbital wall. If the hemorrhage from the nose or mouth is profuse and there is no local lesion or history of injury to the face, it is probably the result of fracture through the anterior or middle fossæ. On the other hand, the beginning of a slow oozing from the nose after the lapse of twenty-four hours has a similar significance. Hæmatemesis in head injuries, in the absence of other explanation, always suggests cranial fracture, partly as an evidence of the profusion of nasal hemorrhage, and in part as a possible result of fracture through the osseous wall of the pharynx. The concurrence of symptoms of intracranial complication will confirm the existence of a fracture which the nature of the hemorrhage has rendered probable.

The cases of nasal and subconjunctival hemorrhage tabulated were in each instance uncomplicated by other hemorrhages. In addition somewhat more than 40 per cent. of hemorrhages from the ear were accompanied by one or the other or by both of these, but usually by the one from the nose. The subsidiary hemorrhages, as they may be termed, then ceased to be of diagnostic importance, except as indicating the possible extent of the fracture.

The subcutaneous hemorrhages of cranial or deeper origin are usually manifest in the mastoid region, and, together with the exceptional instances occurring in the posterior cervical region, are with proper limitation of observance as pathognomonic as are hemorrhages from the ear. There were, in

addition to the nine cases in which there was no other than mastoid hemorrhage, thirteen in which it was complicated by hemorrhage from the ear, and two by hemorrhage from the nose. Seven of these twenty-four cases, of which five were simple mastoid hemorrhages, afforded opportunity for post-mortem examination; the mastoid ecchymosis was observed primarily in all, and was found post mortem to be continuous with a large extravasation into the occipital region of the scalp. The fracture in each traversed an inferior occipital fossa, and in five involved the groove for the lateral sinus. In other cases, including most of the recoveries, the mastoid ecchymosis, which was sometimes accompanied by œdema, did not appear till later—from the second to the sixth day—and in succession to a hemorrhage from the ear. These would seem to be cases of fissure extending from the petrous portion into the mastoid process.

It is possible that blood from a temporal or temporoparietal hæmatoma may gravitate into the mastoid area; but sufficiently careful examination will serve to exclude this source of error. Such a possibility having been excluded, a mastoid ecchymosis may be regarded as an unfailing indication of fracture, the site and extent of which may be inferred from attendant conditions.

An œdema of the mastoid region without hemorrhage was noted in only two instances. One of these was cited in the earlier series,² in which a fracture traversed the groove for the lateral sinus, and was accompanied by obstruction of that vessel by thrombosis. The occurrence of this symptom will necessitate the joint condition of a venous obstruction to cause the œdema and of a fracture to permit its appearance in a cranial region.

In some instances the mastoid extravasation extended into the neck, and occasionally a subcutaneous hemorrhage was limited to that region; in either event the hemorrhage followed extensive occipital fracture. The earlier and the more considerable the visible hemorrhage, the greater the probability

² *Lib. cit.*, Case LXII.

of the existence of cranial comminution or of open fissures. A simple closed fissure would rarely be attended by external hemorrhage sufficiently large to become subcutaneous, and then only after the lapse of some days.

The mastoid and cervical are perhaps the only subcutaneous hemorrhages likely to be brought in question as indicating basal fracture. In a single instance perceptible orbital hemorrhage resulted wholly from comminution of an orbital plate. Punctured fractures when they occurred in this cavity were usually attended by such hemorrhage, but it was the result of the wound of the soft parts rather than of the bone. A hemorrhage into the zygomatic fossa from fracture of the greater wing of the sphenoid bone is conceivable, but if recognized would hardly be distinguishable as such.

Symptoms of basal fractures, aside from hemorrhage, are few and of exceptional occurrence. They are:

- Serous Discharges;
- Extrusion of Brain Tissue;
- Implication of Cranial Nerves;
- Localized Pain.

Serous Discharges.—These were observed in twenty-six cases, nine of which proved fatal, with nine necropsies. They were all from the ear with the exception of one from the vault, and one from the nose. In one instance the discharge was from the pharynx as well as from the ear. In a certain number of cases the source of the discharge may be considered uncertain; in the remainder all the sources to which it has been ascribed were exemplified. The fluid itself may be the serum of blood extravasated within the cranium, the cerebrospinal fluid, the serous effusion of an arachnitis, or the viscid discharge of a middle-ear inflammation. The determination of its nature must be based upon the period of its occurrence, its relation to hemorrhage, its chemical and physical properties, and the significance of concomitant symptoms. The chemical characters of the discharge were not given much attention as they were usually unimportant in diagnosis and the discharge difficult to obtain in sufficient quantity for examination.

There was primary hemorrhage in twenty-one of these cases, of which seven were fatal. The hemorrhage in seventeen cases preceded the discharge by an interval of from a few moments to several (6) days; and in four they were synchronous. In all such cases the serous discharge has no importance in diagnosis, as the certainty of fracture is already assured by the fact of hemorrhage. In one of the five cases in which there was no hemorrhage from the ear there was primary mastoid ecchymosis and œdema.

An analysis of the twenty-six cases shows that in four the discharge was accompanied by other undoubted symptoms of aural inflammation; that in four it was the result of a declining stage of inflammation; and that in fourteen it was the cerebrospinal fluid, as it probably was in four others in which there was more or less reason to question its exact character. The recognition of cerebrospinal fluid was based in all the recovering cases upon profusion, limpidity, and immediate occurrence; and in cases followed by necropsy upon the additional evidence of positive and negative conditions—the presence of fracture and absence of simple or infected subarachnoid serous effusion, and the absence of notable epidural or subdural hemorrhage.

Extracts from the histories of some of the cases of serous discharge from the ear will serve to illustrate the several conditions under which it occurs.

CASE XVII.—*Serous Discharge from an Inflamed Ear; Necropsy.*—The patient fell down stairs; slight primary hemorrhage from the right ear and subconjunctival hemorrhage on the second day; progressive stupor, and on the eighth day unconsciousness, with considerable serous discharge from the ear, which became purulent on the day following; temperature on admission 100.8°, and then normal until the twelfth and last day of life, when it rose to 101.8°.

Lesions.—Limited areas of meningeal contusion, each 1 in. by 1½ in. in its diameters, just posterior to fissure of Rolando; minute opening in posterior surface of right petrous portion through which pus exuded; large subarachnoid serous effusion

in right posterior basal fossa; suppuration and disintegration of mastoid cells.

CASE XVIII.—*Serous Discharge, Probably from an Inflamed Ear; Recovery.*—The patient fell from a ladder and struck upon his head; semiconscious with vertigo on his admission to the hospital; mastoid swelling and profuse hemorrhage from the right ear, which continued till the third day; oozing from the ear on the fifth, which ceased on the sixth, and recurred on the seventh day; previous delirium increased; severe pain in the ear, which was continuous up to the day of his discharge from the hospital on the fourteenth day.

CASE XIX.—*Serous Discharge from the Ear in a Declining Stage of Hemorrhage; Recovery.*—The patient fell from a second floor window; coma and profuse hemorrhage from the mouth and left ear; followed by hæmatemesis; hemorrhage from the ear continued thirty-six hours and was succeeded by a gradually diminishing discharge of bloody serum.

CASE XX.—*Discharge of Cerebrospinal Fluid from the Ear; Recovery.*—The patient, ten years of age, fell 40 feet; transient loss of consciousness; synchronous hemorrhage and watery discharge from the right ear; watery discharge continued till the fourth day; temperature normal; no general symptoms.

CASE XXI.—*Late Discharge of Cerebrospinal Fluid from the Ear; Necropsy.*—Primary hemorrhage from nose and both ears, and later profuse hemorrhage from the pharynx; moderate discharge of watery fluid from the left ear on the fourth day.

Lesions.—Fracture through both middle basal fossæ; comminution of left petrous portion; extensive pial hemorrhage on the right side; marked cerebral œdema; no subarachnoid effusion, but convolutions of the left hemisphere flattened.

CASE XXII.—*Discharge of Cerebrospinal Fluid from Both Ears; Recovery.*—The patient, three years of age, was knocked down by a street railway car; no hemorrhage; primary free flow of a watery fluid of a bluish tint, without tinge of blood or viscosity; ceased in twenty-four hours; no general symptoms; temperature rose to 104° and then gradually receded.

CASE XXIII.—*Late Seropurulent Discharge from the Ear, Probably a Subarachnoid Inflammatory Effusion; Necropsy.*—The patient was thrown from his truck and struck upon his head; free hemorrhage from right ear with mastoid ecchymosis,

followed at once by severe frontal headache and high temperature; hemorrhage continued till third day, becoming more and more serous in character; discharge seropurulent on the fourth day; death on the sixth day, having had marked symptoms of arachnitis.

Lesions.—Fracture extending from occipital region along groove for lateral sinus, and through mastoid process, into petrous portion; pial hemorrhage in right occipital fossa; small hemorrhages into substance of pia mater, each of the size of a pea, in the right frontal region; and pial vessels much distended over the whole vertex; subarachnoid seropurulent effusion over right hemisphere; lateral ventricles filled with a brownish fluid.

CASE XXIV.—*Discharge of Cerebrospinal Fluid from the Nose; Recovery.*—The patient was found unconscious in the street with profuse hemorrhage from mouth and nose, much orbital ecchymosis, and a fractured nasal process of the superior maxillary bone; copious sanguinolent discharge from the nose on the eighteenth day, which began to diminish three days later and ceased only on his discharge from the hospital at the end of another week. The fracture was found to extend into the ethmoid plate.

CASE XXV.—*Discharge of Cerebrospinal Fluid and Later of Subarachnoid Inflammatory Effusion from Ear and Pharynx; Necropsy.*—The patient was knocked down by a bicycle and struck his head upon the pavement; could stand up and walk. On admission to the hospital: Slight hemorrhage, with a synchronous escape of considerable serous fluid from the right ear; back of pharynx blood-stained; no general symptoms. Second day: Constant expectoration of straw-colored fluid; free and constant discharge of watery fluid from the ear, which continued till his death on the fifth day. The patient became restless on the second day, with retching and vomiting; and on the fourth day delirious with twitching of the muscles of the extremities and exaggerated reflexes, which continued till his death. Temperature rose to 104.6°.

Lesions.—Fissure began at the left clinoid process, ran forward through the ethmoid bone, comminuted the right orbital plate, and then divided into two branches—one running forward into the vertical part of the frontal bone, and one backward into the right middle fossa and through the petrous portion into the

foramen lacerum posterius with a subdivision running upward through the squamous portion of the temporal into the parietal bone; thick epidural clot extending from right orbit into middle fossa and over parietal region anteriorly; slight opacity of the arachnoid membrane; hyperæmia of the pia mater; moderate cerebral hyperæmia and œdema and moderate amount of bloody fluid in the lateral ventricles; basal ganglia sodden and flattened; brain convolutions much flattened.

The fluid which primarily escaped from the ear in this last case could only have been the normal cerebrospinal secretion; but the recurrence of the discharge in greater quantity on the second day coincidently with the development of symptoms of inflammation suggested a change from the secretion to the effusion of a subacute arachnitis. This view is strengthened by the post-mortem observations of the flattening of the cerebral convolutions and the sodden appearance of the basal ganglia, and by the absence of the effusion, by which these conditions must have been occasioned.

Extrusion of brain tissue, as a symptom, requires little consideration; that it involves fracture as a necessary precedent is self evident. It occurs in a certain proportion of cases of crushing fractures of the vault, and may then be important as indicating the extent of injury. The loss of large masses of brain matter with recovery of the patient has been often noted. Many instances have been recorded in which with almost entire destruction of the right frontal lobe there has not been even temporary functional impairment. Some of these, as well as a case of recovery after similar destruction of the right cerebrum, were referred to in the first of the two papers upon "Left Frontal Lobe Localization."³ Two of the original cases which comprised the series published in that connection were also of the same character. One, in which at least two-thirds of the right frontal lobe was destroyed, recovered without serious symptoms, though he became epileptic eight years later; the other, with somewhat less

³ Phelps: Am. Jour. of Medical Sciences, May-June, 1902.

extensive destruction of the left lobe, was temporarily demented, but with ultimate restoration of the mental faculties.

The escape of brain matter from the ear occurred in three cases, of which two were fatal. In one of the latter it was accompanied by profuse primary aural hemorrhage; in the other it was also primary and accompanied by hemorrhage from the nose and mouth, but by none from the ear. Death ensued in the first on the fourth day, and in the second after a few hours. The recovering case was included in the series collected in the "Treatise upon Intracranial Injuries,"⁴ and is again noted among the illustrative cases of the present publication. It occurred on the second day, followed profuse primary hemorrhage from the ear, and continued for twenty-four hours. It is of interest as showing that loss of brain tissue with basal fracture is no more necessarily fatal than fracture of the vault; and also as a direct demonstration that recovery may follow inaccessible cerebral lacerations.

There was extrusion of brain matter through the nose in one case which was fatal; and it also occurred into the orbit in a case of gunshot wound and was discovered in the course of operation for excision of the eye.

Implication of the Cranial Nerves.—This accident like the extrusion of brain matter is of very exceptional occurrence; and before its causative relation to functional loss or disturbance can be admitted, intracranial lesion must be absolutely excluded. It is possible that any cranial nerve may suffer structural injury in its exit from the cranium; but, except in case of the second and seventh pairs, it is in the highest degree improbable, and even with these, as was stated, it is exceptional. Some degree of facial paralysis is among the frequent symptoms of head injuries, and the petrous portion of the temporal bone through which the facial nerve passes is in the line of fracture in a large proportion of basal fractures; yet a lesion of the nerve in its petrous canal has been disclosed upon necropsy in not more than one instance, or at the most two instances, of the whole series.

⁴ *Lib. cit.*, Case CCLXIV.

The compression of the optic nerve by orbital fragments was rather more frequent, but occurred in only six cases, scarcely more than 1 per cent. of the 570 basal fractures. All of these were comprised in the first series of 500 cases.

"Four were recognized only upon necropsy, and of these three had died without recovery of consciousness, and the fourth had suffered no loss of vision. In the two cases in which life was preserved the patient upon restoration of intelligent consciousness discovered that he was blind. Ophthalmoscopic examination in the first case, made on the third day, was negative, though the pupil did not respond to direct exposure to light; fifteen days later atrophy of the optic nerve had begun. In the second case the ophthalmoscopic examination was not made until the fourth week; the pupil was then insensitive to light, and atrophy of the nerve was in progress. Entire loss of vision was permanent in both cases." ⁵

If there were other cases of this character they could have been only among those of deaths without restoration of consciousness and without necropsy.

Callan,⁶ who has the histories of twenty-five cases, states that "monocular blindness is immediate, and generally with total loss of light perception. The eyeball protrudes and diverges, and the pupil is enlarged and non-responsive to light. Optic nerve atrophy begins within two weeks."

The two cases cited conform to this description except that hemorrhage chanced to be insufficient to cause ocular protrusion or divergence.

Localized pain is not included in the usual category of symptoms of basal fracture. It has been often noted, however, in this series of cases, and its significance often established in subsequent post-mortem examinations. Its intensity and narrow limitation serve to distinguish it from the more diffused frontal or occipital headaches of intracranial injuries, and it is disproportionate to the amount of superficial contusion. It is most likely to be serviceable in the diagnosis

⁵ *Lib. cit.*, p. 25.

⁶ *Jour. Am. Med. Assoc.*, March 5, 1892.

of fractures beginning in the occipital fossa, and is sometimes the only direct symptom present. Its seat in such cases may be either in the occipital region or over the mastoid process.

How many cases of unrecognized and unsuspected basal fractures there may be is problematical. That there are such is evident from their occasional disclosure post mortem, when none of their enumerated symptoms have existed. It might be reasonable to infer that the more pronounced the indications of intracranial lesion, the greater the probability of the existence of fracture; but it is also to be borne in mind that equally severe and characteristic symptoms of intracranial injury may exist when fracture is absent.

PROGNOSIS.

The results of a study of these cases, so far as it concerns prognosis and treatment, must by reason of limited space be stated in an abbreviated and perhaps somewhat dogmatic form.

Linear fracture, comminuted fracture without loss of substance, and depressed fracture in which the fragments have been replaced in their normal position, unite by definitive callus; and no trace of the osseous lesion remains. Three exceptional cases were observed: one in which a basal fracture through both middle fossæ had united with some displacement of the segments; one which crossed the frontal bone immediately above the orbital ridges and had similarly united with slight displacement; and a third in which an open fissure in the median line of the frontal bone, with appreciable separation and mobility, remained after five years had elapsed.

A loss of osseous substance is replaced by a dense fibrous structure composed of the thickened and consolidated dura mater and periosteum; and is a source of danger in so far as it is a loss of efficient protection from external violence. This danger is commensurate with the extent of osseous deficit and modified by its cranial site. Completely detached fragments separated from periosteum and dura mater, when unremoved, will necrose and may become the medium of infection.

Depressed fragments are confined to the vault and to the orbit, and with early elevation have in general no more serious results than when unattended with displacement. The prognosis may be said to depend largely upon treatment.

The only danger attributable to fracture in itself, whether of the vault or base, is the laceration of brain tissue, or of venous sinuses or other large vessels, by displaced osseous fragments; or the possible implication of an optic or facial nerve in the line of separation.

It is essential to exclude the coincident intracranial injuries in a consideration of the prognosis of fractures. They are not properly complications, as before stated, except in the few instances noted in which consecutive wounds of the brain or greater meningeal vessels have been inflicted by dislocated osseous fragments; but are rather the coexistent results of a common cause—the external violence to which cranium and cranial contents have been alike subjected. It is the failure to recognize this distinction which has occasioned much confusion in both prognosis and treatment.

TREATMENT.

All fractures of the vault raise a question of operation. The treatment here formulated has been the uniform procedure in this series of cases, and is not only rational in theory, but has been justified in practice.

During the continuance of shock no local interference is permissible unless it may be for repression of hemorrhage, or for the aseptic protection of a wound when a fracture is compound. As soon as practicable after reaction has been established, careful examination, and, if necessary to resolve a doubt, thorough exploration should be made of a site of suspected fracture. If no osseous depression or line of fracture can be discovered, and there is no considerable hæmatoma to hamper examination, it may be assumed that no fracture, or at most only a negligible fissure exists. If, however, the existence of fracture is discovered by palpation or if the presence of hæmatoma prevents a positive conclusion,

explorative incision even in the absence of indications of intracranial lesion is demanded. It may be that no fracture will be discovered—if so, primary union under aseptic precautions may be accounted certain, and no conceivable possibility of danger will result from a procedure which has made diagnosis beyond question.

A fine closed fissure in the absence of intracranial complication may be neglected; but an open fissure gives sufficient probability of comminution or depression of the inner table to require further exploration by means of chisel, burr drill, or rongeur.

Depressed osseous fragments are to be primarily elevated under all circumstances, after the occurrence of reaction, except in the possible contingency of a laceration of the lateral sinus, when the extraction of a penetrating fragment may be more safely deferred (see Case XXVIII).

Comminuted fractures should be treated as multiple fissures, with especial care given to depressed fragments. Detached pieces of bone should be removed only when no considerable dural or periosteal attachments remain.

Punctured fractures should be explored when attended by local or general symptoms.

The simplest mechanical means should be employed in the exploration and rectification of cranial fractures. The periosteal elevator, reinforced when necessary by the rongeur, chisel, or burr drill, will ordinarily suffice. The trephine will rarely be required, and should be avoided unless indispensable.

Wounds of the scalp even when primarily infected are devoid of danger in the absence of more distant infection, provided aseptic, or if it has become necessary, antiseptic treatment is carefully maintained. Compound fractures thus become no more serious than those which are simple, and explorative incisions require no justification.

The considerations which have determined treatment as here formulated have been sufficiently set forth in earlier publications.⁷

⁷ Phelps: *Lib cit.*, p. 32; N. Y. Medical Journal, June 11, 1902; *Annals of Surgery*, Dec., 1906.

Direct fractures of the base and the basal continuation of fractures of the vault rarely admit interference. The ethmoid and orbital bones, when subjected to direct violence, may require removal of fragments or the use of aseptic precautions; and fractures of the petrous portion made compound by rupture of the tympanum are at least theoretically made safer by aseptic protection of the auditory meatus. A fracture through the posterior inferior fossa in a single instance was exposed for the relief of hemorrhage (see Case XXVIII).

PATHOLOGY.

The traumatic intracranial lesions may be classified *primarily* as *hemorrhage*, *contusion*, and *laceration*; and their *sequelæ* as *acute* and *subacute meningeal* and *parenchymatous inflammation*—the latter terminating in *abscess* or *sclerosis*. There is additionally a secondary necrosis of the cerebral tissue independent of inflammation.

The primary conditions may occur as isolated lesions or in combination with each other; and the later inflammations which may also coexist may be developed at any period during the persistence of the direct structural changes upon which they in part depend.

As previously stated, when the intracranial lesions occur as complications of fracture they may be coincident or consecutive and usually dominate the symptomatology, afford the indications for treatment, and determine the prognosis of the case.

HEMORRHAGE.—The intracranial hemorrhages should be classified anatomically as *epidural*, *pial*, *cortical*, and *intra-cerebral*.

Epidural hemorrhage is the only one the origin of which is not exactly indicated by its name. This variation in nomenclature is made necessary by the fact that its source is multiple. It may be derived either from the vessels of the *diplœ* or of the *dura mater*, or from the dural sinuses; and may vary in amount from an inconsiderable effusion from the

diploïc structures to one from the larger meningeal vessels so great as to immediately compromise the life of the patient.

The usual source of very large extravasations is the *arteria meningeæ media* or one of its primitive branches. Rupture of this vessel occurred and was discovered post mortem in twenty-five cases, twenty-one of which were accompanied by fracture through a middle basal fossa. In one the trunk of the artery was traversed by a bullet, and in one was penetrated at its bifurcation by the apex of a small triangular fragment of the inner table of bone. In all the other cases of laceration of this artery with basal fracture, as well as in one with fracture confined to the vertex, and in three without fracture, force was directly exerted upon the vessel. In probably all cases it was extended to the general intracranial contents as indicated by post-mortem appearances. The immediate effect was to strongly compress some considerable portion of a hemisphere, which it would seem should squeeze the blood from the meningeal and cerebral vessels, as has been stated by writers to be really the case; but in fact, with a single exception, these vessels were found in every instance to be more or less congested, which is explicable only by a general intracranial contusion. The danger of compression and the visible area of its extent varies with time and other circumstances which determine the amount of hemorrhage. The lateral and basal aspects of the hemisphere anteriorly are primarily affected, but pressure may extend to the posterior regions. The degree of compression may be sufficient not only to flatten but to make concave the cerebral surface, and may even lift it clear of the basal fossa, so that when the clot is removed the whole fossa, including the petrous portion, may be left empty and exposed, and the brain apparently suspended from the vertex. (See Case LXXVII, First Series, *lib. cit.*)

Hemorrhages of such magnitude and such origin are probably always fatal, unless relief is afforded by operation, and even then recovery is exceptional. The shock of the primary loss of blood, and the added shock of an operation, always difficult on account of the inaccessibility of the lesion,

are likely to involve too great a demand upon the recuperative powers of the patient.

The most profuse epidural hemorrhages, however, are not invariably due to rupture of this arterial trunk or its primitive branches. In one case, for instance, a large clot which flattened the whole frontal lobe was derived from a minor meningeal vessel, and in another both occipital lobes were compressed by a hemorrhage from numerous vessels beneath a comminuted fracture. In a third case a whole hemisphere was covered with a thick mass of partially coagulated blood when careful examination showed the larger meningeal vessels to be intact; and in a final instance, one in which a whole hemisphere was compressed to the last degree, the hemorrhage was found to come from some inaccessible point or points in the occipital fossa, and was controlled by gauze pressure between the bone and the dura mater. Operation in such cases as these is oftener successful, since the bleeding vessels are both smaller and more likely to be accessible.

Hemorrhage from wound or rupture of the venous sinuses is usually less profuse, and in case of the superior longitudinal sinus more amenable to treatment. There were eight cases in which this sinus was wounded—seven by a depressed osseous fragment, and one by a sharp instrument. The hemorrhage in each was moderate and readily controlled by plugging or some form of pressure. Recovery followed in six cases. There were four cases of laceration of a basal sinus—two of which were of a lateral, one of a sigmoid, and one of the cavernous sinus. There is no reason to suppose that in such cases operation can be successful. The lateral sinus alone is accessible for interference, the amount of blood necessarily lost is large, and the vicinage of the bulb seems an especial danger.

The two instances of laceration of sinuses not often injured are on account of their infrequency worthy of note.

CASE XXVI.—*Laceration of Cavernous Sinus.*—Fracture extended from a point just above supra-orbital notch through orbital plate, lesser sphenoid wing, and groove for cavernous sinus,

to foramen lacerum posterius; laceration one-third of an inch long in wall of cavernous sinus; epidural hemorrhage of about two ounces in middle fossa. The patient, who had fallen thirty feet through a ship's hatchway, died from cerebral contusion. There were no ocular paralyses; the corresponding pupil began to dilate two hours after admission to the hospital, and thirty minutes later was widely dilated and insensitive.

CASE XXVII.—*Rupture of Sigmoid Sinus.*—Multiple fractures: linear fracture, eight inches long, just in front of and parallel to coronal suture; depressed fracture one and one-half inches square involving frontal and parietal bones; comminuted fracture at parieto-occipito-squamous junction; and fissures extending from middle, through petrous portion, into posterior fossa; large epidural hemorrhage from rupture of the sigmoid sinus in the line of a fissure. The patient fell three stories to the pavement.

One of the cases of laceration of a lateral sinus is also worthy of special note on account of operation.

CASE XXVIII.—*Laceration of Lateral Sinus: Operation.*—A man fell a distance of from twenty to twenty-five feet, and was at once admitted to the hospital. A few hours later ecchymosis and swelling appeared in the left mastoid and cervical regions, which on the third day had greatly increased. Incision was then made in the inferior occipital region and a comminuted fracture disclosed. Osseous fragments were removed, including one of triangular form. After an appreciable interval profuse hemorrhage followed from some inaccessible point, which was readily controlled by a gauze tampon. Respiration soon began to fail, but was artificially re-established. The pulse for a time remained of good character. Death occurred two hours later.

The triangular fragment was found upon necropsy to have penetrated the lateral sinus, which was lacerated and contused in a space of one-half inch. Epidural hemorrhage, which was confined to the posterior fossæ, was not in great amount. The brain lesions were numerous.

In the great majority of cases an epidural hemorrhage is less exclusively the fatal lesion. It is but one of two or more pathological conditions which contribute in various degrees, according to their relative importance, to the fatal result.

Pial hemorrhage is a result of contusion of the pia mater and the blood when in moderate amount is confined to the meshes of the pial membrane in which it is infiltrated. It then appears in one or several patches of variable size situated in any region of the base or vertex. If in somewhat larger amount it forms a sheet, still confined to the pial meshes, which may cover the entire vertex. If still more profuse it will break either into the subarachnoid cavity or directly upon the cortical surface. A statement previously made that the quantity of blood effused "is never so great as it may be in epidural hemorrhage and that its clinical importance is mainly due to its association with other lesions" (*lib. cit.*, p. 46), requires modification. Such a generalization has proved too broad. The cases in which it is "large enough not only to occasion symptoms of general and local pressure, but to destroy or endanger life," while perhaps comparatively infrequent, are not exceptional. The source of hemorrhage, even when this extravasation is large, is almost always confined to the arterioles and capillaries. Two exceptional instances were noted—one in which nearly the whole hemisphere was flattened by a hemorrhage from a small vein just in front of the first frontal convolution; and a second, included in the "Second Series of Left Frontal Lesions,"⁸ in which a hæmatoma extending along the ascending portion of the Sylvian fissure was formed by rupture of the left Sylvian artery. Death in the first instance mentioned seemed to be wholly or essentially the result of hemorrhage. Even when the extravasation is in moderate amount it may of itself occasion death, as occurred in many of the cases of direct compression of the respiratory ganglia.

This hemorrhage has sometimes been improperly called pia-arachnoid. The pia mater is unquestionably a subserous connective tissue analogous to that of the pleura and the peritoneum, and like that serves for the subdivision of the nutrient vessels of the superjacent serous membrane. It differs from other subserous layers, however, in this, that it also

⁸ Phelps: Am. Jour. Med. Sci., March, 1906, Case XI.

serves for the subdivision of the nutrient vessels not only of the cortex but of the whole substance of the viscus which it covers. This function is so important that, unlike the other subserous tissues, it has received a distinctive name; and while, as pointed out by Dr. Alonzo Clark many years ago, the inflammation of which the processes are largely manifested in its substance is an arachnitis, there is no reason why its hemorrhages or œdemas, with which the arachnoid membrane has no connection, should be termed otherwise than pial. To combine in name the two membranes, as pia-arachnoid, ignores the function of the pia mater; to call the hemorrhage into the pial tissue pia-arachnoid assumes a relation which does not exist.

Cortical hemorrhage is occasioned by a laceration of the brain substance, and is primarily situated upon the cerebral cortex, and beneath the pia mater. It is often profuse and then breaks through the pia mater into the subarachnoid space, and, as in one case in which the dura mater had been wounded, may even spread over the epidural surface. The cerebral wound may be cortical, or the hemorrhage from a subcortical laceration may reach the surface by rupture of intervening tissues. The extravasation is sometimes slight, but is more frequently excessive than when pial or epidural; and as lacerations are most frequent at the cerebral base, it especially affects the basal fossæ.

These several forms of hemorrhage often coexist, and the pial and cortical are not infrequently commingled. They are even then usually capable of discrimination. The epidural hemorrhage is at once recognized by its topographical relations to the dura mater; the cortical hemorrhage can always be traced to a wound of the cerebral surface; and the pial hemorrhage when uncomplicated by the cortical is differentiated by exclusion—by its situation beneath the dura mater, and by the absence of cortical wound or rupture. The pial and cortical hemorrhages when coexistent are often situated in different cerebral regions; but when a cortical extravasation breaks into the pia mater it is of course impossible to determine

whether a pial hemorrhage had pre-existed in the same area.

Intracerebral hemorrhage is so related to subcortical laceration, either as cause or effect, that it will be best to consider it in that connection.

The different intracranial hemorrhages occur with about equal frequency, and one or more of them are present in the vast majority of cases. Their pathic effects vary in accordance with their extent and relation to other lesions rather than with their source.

It seems probable that neither form of hemorrhage is ever an isolated lesion. The same violence which is sufficient to rupture a dural or pial vessel, or to produce a superficial cerebral wound, can hardly fail to be further transmitted and diffused through the whole or some considerable portion of the brain substance; that general circulatory changes have occurred is an obvious fact in a very large proportion of necropsic examinations, in which obvious facts are so often overlooked. It becomes a question therefore what symptomatic conditions may be due to hemorrhage and what to concurrent lesions; and a still further question, in what manner hemorrhage produces the effects for which it is properly responsible. There are cases of death as to the causes of which there can be no question—as in shock, exsanguination, or compression of the respiratory ganglia. The greater number of deaths, those which occur when hemorrhage seems to have been an essential lesion, can be less simply interpreted. It has been taught that a hemorrhage, or even an osseous fragment of inconsiderable size, by mechanical compression of the cerebral vessels and their exsanguination, produces a cerebral anæmia which affords adequate explanation for consecutive symptoms; and yet the osseous fragment may be of size quite insufficient to appreciably reduce the cranial contents, or the hemorrhage may be attended by a general cerebral hyperæmia, and not by anæmia. It has been proven by experimentation that mechanical compression induced without violence may cause fatal coma through a progressive cerebral anæmia; and it may be admitted that an intracranial hemorrhage under

certain conditions may cause death in the same manner. It still leaves for explanation the greater number of cases—the typical cases—in which minor hemorrhages with similar symptoms have been followed or attended by an opposite circulatory condition.

It has been customary to link together all encroachments upon the intracranial space under one common name, compression, and to assume common structural changes indicated by certain identical symptoms. In fact, their one common characteristic is of no material importance; their pathology is essentially diverse. The apparent results of osseous depressions and of the majority of hemorrhages depend upon concurrent lesions; and the mechanical effect of inflammatory products is lost in the manifestations of the primary disorder which produces them. The local pressure which results from minor encroachments upon cranial capacity differs from compression which is general, and it is only when it is exerted upon cerebral centres of functional activity that it has indications of its own.

Hemorrhages of moderate extent are probably removed in cases of recovery by direct absorption; and this removal is doubtless facilitated in those cases in which some portion has been previously removed by operation. Large clots may be encysted and liquefied prior to absorption, and such have been observed post mortem in various stages of this process. The cysts may become permanent and are often discovered beneath unrelieved depressed fractures of long standing in the course of operations for the relief of epilepsy.

(To be continued.)^a

THE RATIONAL TREATMENT OF NON-MALIGNANT AND BORDER-LINE TUMORS OF THE BREAST.*

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REVIEWING the present status of the cancer question as compared to its position twenty years ago when I first became interested in it, it seems to me that I can identify only two facts of value that have developed, namely,—that cancer is steadily increasing in frequency; and that the only form of treatment of definite value and of increasing efficiency is wide removal at an early stage.

The value of all the investigations that have been and are now being conducted is not deprecated,—moreover I confidently hope that in the near future this hitherto unthankful task may reap the reward of a discovery that in value to humanity will outrank all previous achievements of science.

I am wondering, however, if, bewildered by the maze of attractive propositions regarding etiology and treatment arising almost daily, we have clung with sufficient tenacity to the one really reliable fact that has been demonstrated, namely,—that a cure is possible by early operation. I think not. For the mind of the public,—medical, or lay,—is ever on the alert for novelty,—that is the spirit of the age. Why waste any time over a fact which has been repeated monotonously for years when we can get excited over some dazzling achievements of radio-activity—or become delightfully entangled in the countless possibilities of sera and kindred attractive forms of therapeutics.

I think that if those who believe, as I always have, in the propositions here advanced, had expended only a small

* Read before the New York Surgical Society, Jan. 13, 1909.

proportion of the energy that has been wasted in pushing these various Will-o'-the-wisps, in steadfastly, doggedly keeping the known facts and results on an equal footing in interest, this paper need not have been written. Although this essay contains not a single new feature I believe there is need of this and similar efforts to emphasize and develop the usefulness of our present known resources.

My plea in regard to neoplasms of the breast is,—that they should all be held to be malignant until their innocence is proved; and the complement is,—let no guilty tumor escape.

The generally accepted figures of the proportion of cancer to other tumors of the breast is eighty to eighty-five per cent. In that mere fifteen to twenty per cent. remaining, there will be other forms of malignancy such as sarcoma and a certain number of other conditions, disease, cyst or new growth which will eventually undergo transition into malignant changes. So in sporting parlance we have about nine chances to one against any given tumor being non-malignant.

What really interests us in the diagnosis of these tumors, is not the ordinary carcinoma of the breast, whose nature is hopelessly obvious to any one, because these cases will only very exceptionally be cured even by our most extraordinary efforts; they are usually doomed when we see them. It is the cases that may or may not be carcinoma that should be our chief concern, the cases so little pronounced that if really malignant they afford a reasonable chance for successful treatment.

It is in those relatively simple conditions that seem so clear, chronic or involution mastitis, adenomata and the several forms of cysts, that the danger lurks. For, believing that they surely represent these conditions we may let pass the golden moment when a beginning process absolutely unrecognizable except for the revelations of the microscope, might have been seized upon as a local disease and surely extirpated.

Moreover if we are right about the innocency of a given process at a given moment what guarantee have we that time will not produce those fatal changes which we know or should know may and so often do occur?

Is there anyone who can infallibly pronounce on the nature of such tumors of the breast? Certainly I cannot and I know of no one who is so qualified; the more the surgeon's knowledge of the subject the more will he distrust it. And yet how often do we hear of a physician whose yearly experience is limited to an occasional case confidently reassuring the patient that her "lump" is "nothing." He may be right *then*, but how about the future? And the patient who has been willingly assured that it is "nothing"—will she use any extraordinary haste in again seeking an opinion about the "nothing" which later and insidiously becomes *something*, that *something* which will cost her her life? The most cock sure individual (and therefore the most dangerous) is the one who goes a step further and "confirms" his diagnosis,—the prudent doctor who introduces a hypodermic needle and draws off fluid: "A simple cyst, just as I thought." How grateful to the anxious patient is this little short, simple word cyst,—"a bag of water"—surely it can't have any of the horrid possibilities of long words ending in *ma*, *tis*, or *um*.

While decrying the practitioner's attitude, I do not seek to fasten the blame on him. Are we who have experience, who ought to know, have we done our duty in making the position clear, is our attitude consistent? Have we offered a clean cut definite rule of conduct, have we created a standard? I think not or certainly not sufficiently so for the needs of the problem. Many good men have described the situation; but there can't be too much evidence, and there are those whose writings and teachings lack preciseness, and some whose vacillations may be offered as justification by those who wish to bolster up an unjustifiable procrastination. In the vocabulary of cancer, that delightful word conservatism, so successfully overworked, finds no place except for those we have abandoned.

What then do you recommend? someone will certainly ask now if he has had the patience to withhold his question so far. Will you cut out the tumor or the breast of any person without regard to the age, origin or course? Cer-

tainly not, but whatever else I may or may not do, I am going to investigate and so far as possible prove the nature of any of these manifestations whenever it is reasonably possible so to do. Then and not till then will I have done my full duty.

We have to consider the following questions:

First.—What are the dubious or border-line cases?

Second.—How shall we make the diagnosis?

Third.—What if any shall be the treatment?

As regards the first proposition, we have to deal with a limited number of conditions and relatively fewer cases, as unfortunately the immense majority of cases of tumor of the breast coming to the surgeon have cancer, written large and hopeless on them. Such and any tumors which so closely simulate cancer in their general characteristics should be removed any way; we shall only have to complete the diagnosis, as will be later described, in order to know how extensive an operation is required.

The smaller number remaining are made up of the various forms and combinations of adenoma, the several forms of cysts and the group of lesions classified as chronic mastitis or involution changes. Rarer conditions, such as the apparently primary tuberculosis, retromammary lipomata, hydatid disease and gummata must be borne in mind. The important feature to remember is that almost any of those processes is likely to become the seat of secondary changes and eventually become malignant after years of quietude when the patient approaches or reaches the carcinoma age.

Just as our chief concern is to forestall the development of cancer, so we may remain ultraconservative both as regards the necessity of obtaining an exact anatomical diagnosis and the application of radical treatment in individuals under twenty-five. True, cancer of the breast is very rarely seen younger than this age; but in the absence of clinical features of importance (rapid growth of sarcoma in young girls) we may hold these tumors to be innocent. Even up to thirty the indications are not urgent. Past thirty we should be

more vigilant and more aggressive. Past thirty-five we must assure ourselves definitely of the nature of the tumor, and in most cases forestall future changes for the worse. Forty and over is the definite carcinoma age—and at this stage not a single chance must be taken. So that in younger individuals we may content ourselves with our clinical diagnosis of innocent tumors, reserving only certain ones which are rapidly growing or have suspicious features attached to them for the more elaborate anatomical diagnosis.

How shall we make the diagnosis? It can be made with *certainty* only on an anatomical basis. That is by the removal of a *sufficient* section or sections for microscopical examination; and here comes a situation which requires to be defined clearly. A very small fragment of a malignant tumor (removed by any one of the devices favored for that purpose), will suffice to give a positive diagnosis. Now suppose we have a border-line tumor, remove a small fragment and get an anatomical diagnosis of a non-malignant growth—are we in any way better off than we were before? The answer must be emphatically,—No! in the majority of cases, for time and time again it has proven to be fallacious to trust to such a gamble as to whether a given portion of a tumor yields definite information of a latent focus of malignancy.

Certainly we do not want to trust in any of these border-line cases in older women, past thirty, to any hap-hazard form of investigation. Here the diagnosis must as a rule be confirmed by the form of operation which will here be recommended. This statement is particularly true as regards the use of the hypodermic needle which reveals the presence of a cyst: a cyst means epithelium playing a rôle which is abnormal, and even if it is not malignant it has all the possibilities of becoming so.

To recapitulate,—in younger individuals, say up to thirty, in the cases devoid of significant features we may rely on ordinary clinical findings; past that age it becomes more and more imperative to make the diagnosis certain; once arrived at the carcinoma age it can and must be made any-

how, as some form of interference must now be the rule. So that in the later group the procedures of diagnosis and treatment will be simultaneous. That is, a sufficient exposure of the diseased breast must be made by an incision for the demonstration, gross and microscopic, of its nature.

This procedure which will be described under the name of plastic resection, given to it by Dr. J. Collins Warren,¹ allows of a much freer application of diagnostic methods and more radical measures even in relatively benign conditions owing to the absence of mutilating or disfiguring features which distinguish other or even simpler methods.

Treatment.—Small stationary tumors which do not cause mental or physical disturbances in younger individuals up to thirty years of age may as a rule be disregarded, particularly so if occurring in young unmarried women and those whose social status and habits render active interference undesirable. Generally speaking, the more intelligent and receptive to advice and caution the individual, the more may she be "trusted" with her tumor. In the less favored class of society, those who may never seek or have occasion to receive further advice, we ought to shoulder the responsibility for them. If any of these tumors at any age or stage grows rapidly or quite steadily it ought to be removed if for no other reason than the necessity of anticipating severer operations proportionate to an increasing bulk.

Between thirty and thirty-five a definite lump will be better removed,—it represents distinctly a morbid process and every year brings the individual nearer to the time when she must not have abnormal processes in her breast.

Past thirty-five I would make no exceptions except for very definite reasons and assuredly *never* in any process which was increasing steadily.

The treatment of tumors of the breast by the operation

¹ Warren: "The Surgeon and the Pathologist," Journal of the American Medical Association, July 15, 1905; "Abnormal Involution of the Mammary Gland," American Journal of the Medical Sciences, April, 1907.

of "Plastic Resection" (J. Collins Warren), is the operation in which we have the possibility of giving relief to many conditions which we should otherwise be inclined to leave alone from dislike of proposing a disfiguring or mutilating procedure unless unequivocally necessary, and certainly our patients would be equally reluctant to entertain the idea.

The operation performed according to Professor's Warren's admirable technic should leave only a very fine scar, well hidden in the fold which the lower half of the breast makes with the chest wall,—that is, no visible scar under ordinary conditions. Small tumors or diseased areas may be exsected without material change in the contour of the gland and even the removal of considerable portions may result in a minimum of disfigurement if one skilfully "reconstructs" the organ according to Dr. Warren's directions.

The operation has been so well described by Dr. Warren and others that only a very brief description of it is necessary here. Those unfamiliar with it are recommended to refer to the original articles, also Dr. W. L. Rodman's valuable work on the breast which contains admirable plates showing the exquisite cosmetic results obtainable.

The cutaneous incision is made in an exact half circle, the central point being at the lowest portion of the reflection of the breast on the chest wall. It is sufficient for access to any part, even the uppermost, of the breast, which can be tilted on its horizontal axis so that the under surface is dislocated into the wound. To obtain access to processes situated lower down or more to one side than the other, one or both legs of the ascending curve may be shortened, or a quarter circle may suffice. It is well to make the incision rather higher on the breast than below it, as the overhanging breast will more effectually conceal the scar. The incision is deepened till the fascia of the pectoral muscle is *reached*; it should not be cut. The interposed distinct layer of areolar tissue yields to a stroke or two of the scalpel and the breast is easily and completely mobilized. It is grasped by the left hand, the thumb being on the under surface. By depressing the fingers

FIG. 1.

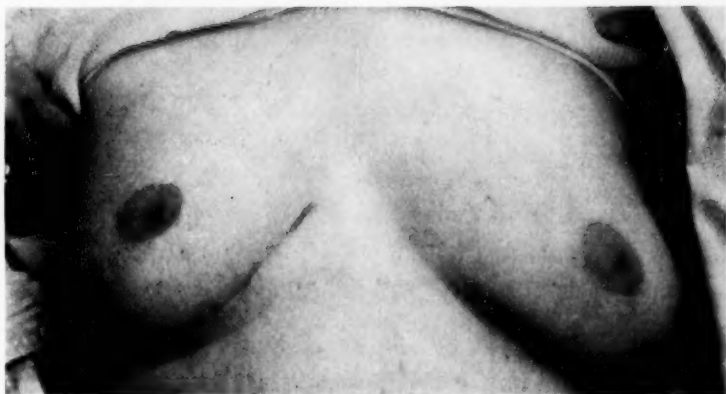
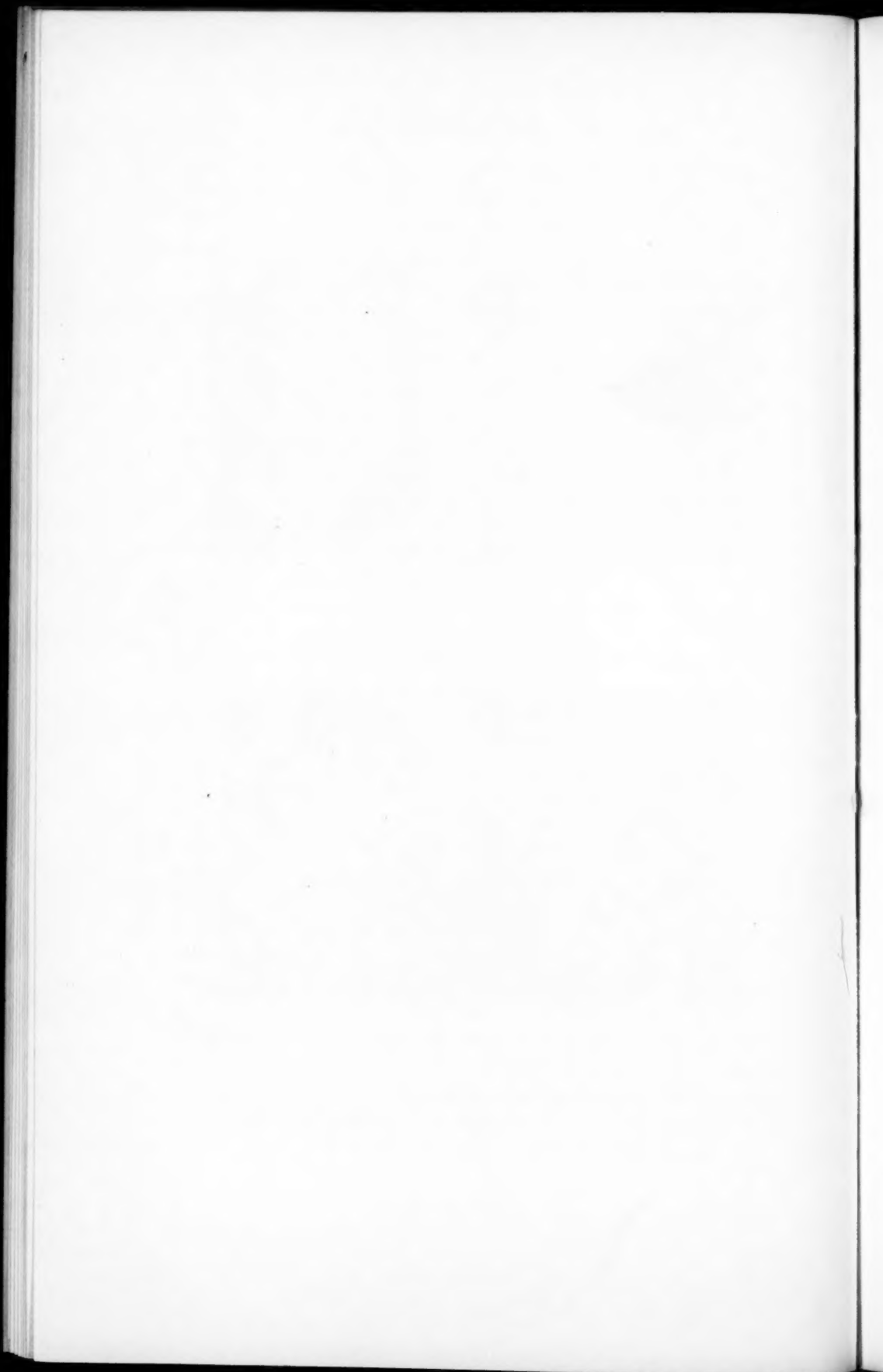


FIG. 2.





and elevating the thumb the whole under surface of the breast becomes accessible to sight and touch.

The essential step of the operation is now performed. The surgeon selects the portion of tumor or tissue which appears to be the most affected, exsects it, and gives it to the waiting pathologist, who with his present technic (frozen section) can give him a satisfactory report in five minutes. Having, however, gone so far in his procedures, the surgeon will probably wish to remove the visibly changed tissue even if the microscopical diagnosis eliminates malignancy. Some discretion may well be exercised regarding the extent of tissue to be removed when the necessity of preserving cosmetic ideals comes in question. Should the report show malignancy the operator can quickly proceed to perform the kind of operation suitable to the condition.

In removing the tumor or disease, the operator will find it better to cut it out by wedge-shaped incisions ("cutting pieces of pie" is the expression Dr. Warren used when demonstrating the method to me). If there are separate foci, less destruction of the breast tissue will result from the making of multiple wedges. Generally speaking it will be wiser to go no nearer the periphery than is absolutely necessary. These lacunæ in the breast resulting from excision as above described are obliterated by uniting their cut edges with catgut sutures. By the exercise of a little ingenuity this process of "snuggling" up the tissues will often result in a quite perfect contour of the organ. Dr. Warren lays great stress on the "reconstruction" which tends to push the apex of the breast,—the nipple,—forward.

The most careful hemostasis is necessary as it will be best to dispense with drainage. I always close such wounds by putting in a few interrupted sutures in the subcutaneous fat, and using the finest interrupted silk sutures for the skin; these are removed at intervals,—most of them in three days.

The application of the dressings should aim at preserving the cosmetic requirements by proper support.

Such an operation need keep a patient in bed for only

a day or two, the wound should heal kindly and firmly in about eight days.

Result.—Very little, often no disfigurement, the patient is definitely rid of her trouble, and we have not only replaced doubt by certainty, but also made a distinct advance in the *prophylaxis* of cancer.

My personal experience of this operation has been most gratifying, and the gratitude and appreciation of the patients has been marked.

The views and the line of treatment which I have outlined will doubtless seem ultraradical to some, perhaps many, physicians. I doubt, however, if I need to apologize for this attitude, as it is sufficiently upheld by many sound surgeons. I believe it is only a question of time when such views will constitute the only "safe and sane" line of conduct applicable to these dubious or border-line cases. On the principle of the greatest good to the greatest number, their adoption can only make for improvement in our results.

Of those who may question the necessity of such an inflexible line of conduct, I would ask: Can you deny the truth of this proposition,—the systematic adoption of the measures herein advocated will reduce the number of deaths from cancer of the breast?

MESOCOLIC OR RETROGASTRIC HERNIA.

BY WILLIAM J. MAYO, M.D.,

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Surgeon to St. Mary's Hospital.

A REVIEW of the literature on rare forms of intra-abdominal hernia, for which I am indebted to Dr. D. C. Balfour, leads me to the conclusion that the two following cases are sufficiently unusual to warrant a report of them. It is interesting to note that notwithstanding the peculiarity of the conditions, the operative findings were practically identical, and the original pathological lesions were the same in each instance. Both patients came under observation and were operated upon during 1908.

CASE I.—Mrs. K., aged 59, gave a history of having had, during the past fifteen years, attacks of severe "indigestion," *i.e.*, epigastric pain of a crampy character coming on one-half to one hour after meals, reaching its greatest severity three or four hours later. This pain was accompanied by much gas and sour, burning eructations. The patient would frequently vomit immense quantities of undigested food-remnants sometimes streaked with flecks of blood, when the retching was severe. Several times she had vomited food known to have been eaten a week previously. Her bowels were irregular and she had been troubled a great deal with flatulency and occasionally with general abdominal cramps. She had lost much in weight, strength, and appetite, and was in an emaciated condition when she presented herself for consultation.

On examination, marked visible peristalsis was found over the whole abdomen, and a peculiar fulness and resonance in the upper abdominal zone. Air dilatation showed the lower stomach border just over the pubes. The stomach contained food-remnants after fourteen hours. An examination of the contents after an Ewald test-breakfast showed total acidity, 75; free HCl, 65; and combined HCl, 10. At this time there was no evidence of any

occult blood either in the stomach-contents or *fæces*. The marked anæmia present was found to be the simple secondary form.

From the history obtained from the patient, together with the physical examination, it was evident that pyloric obstruction was present, probably due to a long-standing ulcer near the outlet of the stomach, and an exploration was advised.

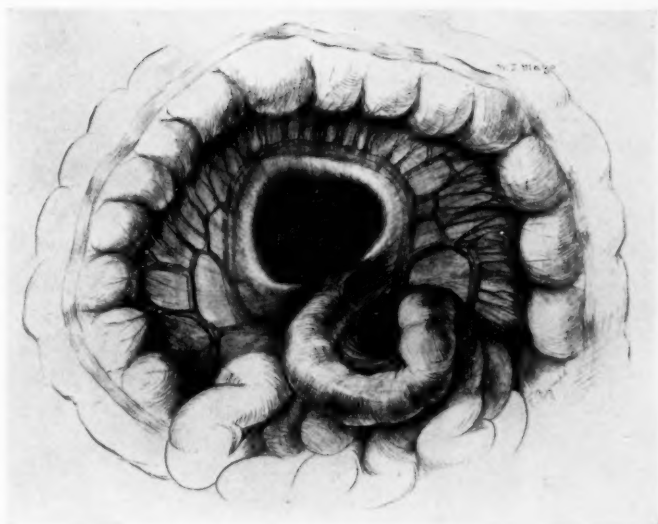
The operation was performed at St. Mary's Hospital, May 30, 1908. The abdomen was opened by a median incision above the umbilicus, and the distended intestine came at once into view. The stomach was completely covered with the small intestine. The mesentery was traced to an opening in the gastrohepatic omentum which allowed the ileum and jejunum to lie above and in front of the stomach. On reduction a huge rent of the mesocolic omentum was found through which the entire small intestine, with the exception of the first three inches and terminal foot, and the whole extent of the mesentery had passed into the lesser sac of the peritoneum behind the stomach and out through a second opening in the gastrohepatic omentum. The opening in the mesocolon was at the exact site where this structure is split to admit of the usual posterior no-loop gastro-enterostomy, and extended up to the circle of the middle colic artery (Fig. 1). The openings in both the mesocolon and gastrohepatic omentum were about five inches in diameter and the margins were round and smooth, the condition evidently being of long standing. There was no limiting peritoneum or sac. Four inches from the origin of the jejunum was a marked groove where the intestine had hung over the lesser curvature of the stomach. After reduction, the hernial opening was closed by suturing the margins with linen to the posterior wall of the stomach.

There was a large ulcer of the duodenum present extending up to the pylorus, adherent behind and causing a most marked grade of obstruction, for which a posterior no-loop gastrojejunostomy was performed.

The patient made an uneventful recovery, left the hospital on the eleventh day, and was discharged eighteen days from the date of operation.

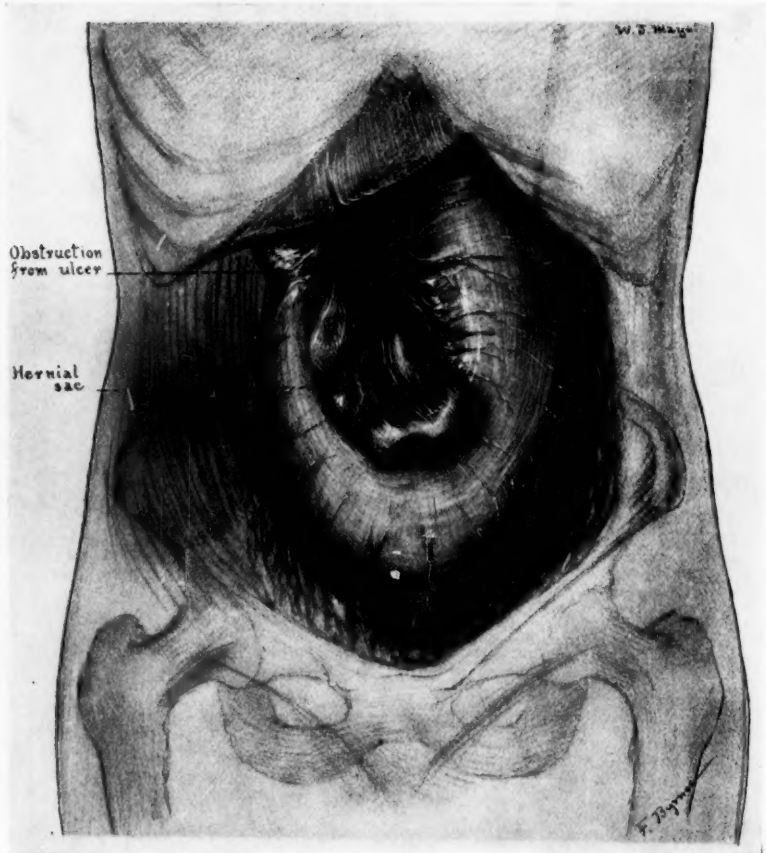
CASE II.—Mrs. S., aged 32. Although comparatively a young woman, this patient had a history of stomach trouble extending over a period of some 25 years, having had since a child attacks of severe epigastric pain, radiating through to the back and asso-

FIG. 1.



Showing the hernial opening in the transverse mesocolon.

FIG. 2.



Shows the hernial protrusion in Case II, as it appeared above and in front of the stomach.

ciated with much gaseous distention and frequent vomiting. These attacks had no constant relation to meals and the intervals between them varied greatly in duration. During these latent periods the patient would enjoy comparative comfort, and at one time was free from all symptoms for some four years.

Recently, however, the condition became aggravated, the attacks more frequent, and the pain often severe enough to require morphine. She had acquired the practice of relieving her distress by drinking large quantities of water to induce vomiting; the washings always contained food particles. On air distention the stomach was found to be greatly dilated and contained food-remnants after 14 hours. Ewald breakfast showed moderate free acid and occult blood, but was unsatisfactory because of the great retention.

The patient was operated upon December 5, 1908, at St. Mary's Hospital. On opening the abdomen by an incision above the umbilicus a peculiar tumor above the stomach presented as a hernia-like mass behind the stretched and bulging gastrohepatic omentum, depressing the stomach so that the lesser curvature was on a line with the umbilicus and the greater curvature at the pubes (Fig. 2). Drawing up the stomach, omentum, and transverse colon, an opening was found in the transverse mesocolon some four inches in diameter, and as in the previous case, at the point where the mesocolon is usually opened in a posterior gastro-enterostomy, that is, in the avascular portion in front of the ligament of Trietz (Fig. 1). Through this opening about five feet of the jejunum had entered, passed behind the stomach, carrying the peritoneum of the transverse mesocolon ahead as a sac, the firm ring of which was at the loop of the middle colic artery. The sac passed behind the stomach, pressing upon and pushing forward the gastrohepatic omentum as an outer sac. These two structures had become fused, obliterating the lesser cavity of the peritoneum at that point, over an area about the size of a silver dollar. The stomach was prolapsed and dilated so that it filled almost the entire abdomen and pelvis, and contained three quarts of food and fluids, which were removed during the operation. There was an ulcer of the first portion of the duodenum which had perforated posteriorly and become adherent to the head of the pancreas. The sac was obliterated by linen sutures to the posterior wall of the stomach and posterior no-loop gastro-enterostomy was performed.

The patient's convalescence was uninterrupted. She gained weight at the rate of a pound a day for the first 22 days.

These two cases present features of interest not only on account of their rarity but also because of the primary pathological condition which appears to have been the important factor in the production of the hernias.

Both patients were of the type of build Martin describes as typical of Glénard's disease (*Surg., Gyn., and Obstet.*, Dec., 1908). The kidney of each was prolapsed, the uterus low and retroverted, and undoubtedly there was in each case a primary prolapse of the stomach. The duodenal ulcer which existed in both had undergone a chronic perforation causing dense adhesions and fixing the duodenum beyond the stomach just as the cardiac end is held normally by the œsophagus. Had the ulcer been the usual type of saddle ulcer of the lesser curvature of the stomach, the hernia could not have occurred because of the adhesive obliteration of the upper part of the lesser cavity of the peritoneum. The obstruction in both instances was extreme, the huge stomach sagging down in front of the intestines. The patients were emaciated and dehydrated and for months had been in the habit of emptying the stomach every 24 to 48 hours of a great accumulation of undigested and unpassed food products. The abdominal muscles exerted great force in these violent efforts at vomiting, compressing the intestines behind the stomach, which was fixed at each extremity and greatly prolapsed in its middle part. In this way pressure was brought to bear on the transverse mesocolon upward in the line of least resistance, causing this peculiar form of hernia.

INGUINAL HERNIA OF THE CÆCUM.

BY JOHN BERTON CARNETT, M.D.,

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Phoenixville Hospital.

COMPARATIVELY little has been written about inguinocæcal hernias by American and English surgeons. The cæcum forms the contents of a hernia with sufficient frequency and under such greatly different anatomical relations that further study of this subject is desirable to clear up several disputed points.

The cæcum is that portion of the large intestine lying below the entrance of the ileum. On an average it is two and one-half inches long and three inches wide. It may be much larger or smaller or may be congenitally absent. As a rule the cæcum does not have any direct connections, mesenteric or otherwise, with the abdominal parietes, but hangs from the ascending colon free in the abdominal cavity and is covered on all surfaces by peritoneum. The position of the cæcum, which varies greatly in different individuals, is determined chiefly by the position and attachments of the ascending colon.

A study of its development explains the variations in the anatomical relations of the ascending colon. For a time during early fetal life the greater part of the intestines lie within the umbilical cord, but between the seventh and ninth weeks they are drawn into the abdominal cavity. At this time the entire great intestine lies to the left of the median line. With the superior mesenteric artery as an axis, the cæcal end of the large intestine passes upward to the cardiac end of the stomach, across under the liver, and finally downward to reach the right iliac fossa about the eighth month of intra-uterine life.

The cæcum may be retained in the umbilical cord, forming

a congenital umbilical hernia, or it may be arrested permanently at any point along its normal circuit, or its direction may be diverted when it can occupy a position in the left iliac fossa, as in several cases collected by Lockwood. On the other hand, it may arrive at the iliac fossa as early as the fourth month.

During its period of development the ascending colon is provided with a mesentery, attached to the spine, in common with the small intestine. This primitive ascending mesocolon permits great mobility of the colon and may persist in adult life, as in two cases out of one hundred autopsies reported by Treves.

In the great majority of cases, however, the ascending colon loses its primitive mesocolon before birth and gains a secondary attachment to the posterior abdominal wall in the right lumbar region by a process of fusion (Fig. 1) between the posterior parietal peritoneum (*e*, *d*) and the superjacent leaflet of the primitive mesocolon (*a*, *b*). These two peritoneal layers then degenerate, forming areolar tissue or a thin fascial layer, and lose their identity as serous structures; and that leaflet of the primitive mesocolon (*a*, *c*) which originally faced toward the median line (anterior leaflet) becomes the posterior parietal serous covering. The ascending colon at this stage has acquired a position which heretofore has commonly been called retroperitoneal. In the new-born always, and in the adult usually, after breaking through the line of adhesion between the anterior leaflet of the primitive mesocolon and the lateral parietal peritoneum, at the outer border of the colon (*a*, *e*), it is possible to separate the two fused layers and re-establish the primitive mesocolon. Some modern anatomists maintain the view that the colon is never extraperitoneal, inasmuch as there exist two fused peritoneal layers between this viscus and the posterior abdominal wall. The interpretation of the term "retroperitoneal" has served as a constant source of contention between the surgeons and the anatomists who have discussed cæcal hernia. It therefore seems wise to reserve the terms "retroperitoneal" and "ex-

traperitoneal" for those viscera (as kidneys, ureters, bladder, etc.) which, while lying in partial contact with the peritoneum, were never surrounded by it, and to employ the terms "retroserous" and "extraserous" for those viscera (as ascending and descending colon, duodenum, pancreas, etc.) which at one time, for all practical purposes, might be considered as having been completely intraperitoneal, but which by fusion have lost their serous layer on one or more aspects. These terms will be employed with the above meaning in the remainder of this paper.

After the primitive ascending mesocolon becomes lost by fusion the colon is held in fairly close contact with the posterior abdominal wall. It may retain this position, or in later life the peritoneum at either side of the colon may elongate and form the adult or definitive ascending mesocolon.

The reflection of the peritoneum from the posterior surface of the lower end of the ascending colon is usually transverse and is commonly placed between a line on a level with the summit of the iliac crest and another line on a level with the anterior superior spine of the ilium (Treves). Ordinarily the obliteration by adhesion of the parietomesenteric peritoneal angle is incomplete at the lower end of the ascending colon, so that on an average its lowermost one and one-half inches (Treves) are entirely covered posteriorly by peritoneum and have no direct parietal attachment. It therefore resembles the cæcum, whose serous covering is derived from an outgrowth of the peritoneum forming the primitive mesocolon. When suspended by these attachments Treves found that the apex of the cæcum corresponds with a point a little to the inner side of the middle of Poupart's ligament. Sobotta locates the middle of the lower cæcal border at the midpoint of Poupart's ligament. The internal abdominal ring lies halfway between the anterior superior spinous process of the ilium and the symphysis pubis. The anterior surface of the cæcum when distended lies in contact with the anterior abdominal wall (Sobotta). It is therefore evident that the cæcum customarily bears an intimate relation to the internal ring.

Deviations from this position are not infrequent. If the colonic attachments are elongated or the cæcum itself unusually long the latter may rest in the true pelvis.

In nearly one-third of a series of 435 autopsies Robinson found that the cæcum occupied what he terms the potential position. The mobility of the cæcum was so great that it was found in diverse positions within the abdominal cavity; it could be made to touch every abdominal viscus and could enter any abdominal ring. The potential position is characterized by an unduly large cæcum; by the distal one to four inches of the ascending colon being free from posterior attachments, and entirely covered by peritoneum; and either by persistence of the primitive ascending mesocolon or by the presence of a well-developed definitive mesocolon.

Infrequently the peritoneum on the posterior surface of the cæcum undergoes the same process of fusion as occurs with the one layer of the primitive mesocolon, and the cæcum thus acquires an extraserosus position. According to Jonnesco this happens in 8 per cent. of cases, but it is considered a much rarer anomaly by most modern anatomists. Treves did not see a single example in 100 cases. Schultze states that the posterior coat may be wanting, and the cæcum is then adherent to the iliac fossa. Tuffier found the upper posterior one-third of the cæcum adherent to the abdominal wall in 9 adults and old men in a series of 120 autopsies at all ages. In the remaining cases the cæcum was completely free. Perignon found the cæcum always free in infants and adherent 7 times in adults. Legeue found the cæcum adherent 6 times in 100 infants. Huntington's book contains a photograph of a cæcum whose posterior surface is extraserosus. The older anatomists erroneously claimed that the cæcum is always extraserosus.

In view of the manifold possibilities in the anatomical relations of the cæcum it is not surprising that hernia of this viscus occurs in so many diverse forms.

The congenital form of cæcal hernia may originate in any one of three ways.

1. The mobility of the cæcum and its proximity to the

internal ring easily permit its entrance into a patulous vaginal process, either before or after birth, forming a congenital inguinal hernia. The cæcum itself is clothed throughout by peritoneum and lies within the hernial sac. The contents of the sac may be cæcum and appendix only, or there may in addition be parts of the ascending colon, small intestine, and omentum. Adhesions from inflammation of the sac, cæcum, or appendix may form subsequently and prevent reduction.

2. The cæcum may be actively drawn into the vaginal process by means of its excessively developed connections with the testicle. About the seventh month of intra-uterine life the testicle lies within the abdominal cavity near the internal ring. It is loosely attached to the posterior abdominal wall by its mesorchium. The two peritoneal layers of the mesorchium are continued upward as a peritoneal fold enclosing the spermatic vessels. This fold is designated the *plica vascularis* and on the right side terminates in the appendix, cæcum, ileum, or primitive mesentery. Wrisberg was the first to advance the theory that the descent of the testis exerted sufficient pull on this fold to drag the structures attached to its upper extremity into the *processus vaginalis*.

In many cases of congenital cæcocele which have come to operation or autopsy the *plica vascularis* has been observed extending from the cæcum or appendix to the testis and forming a ridge on the interior of the posterior wall of the sac.

In a young infant in whom this fold was not perceptible in the sac, Lockwood found that the muscular fibres of the gubernaculum extended above the testis and were inserted in the cæcum and posterior parietal peritoneum. His claim that these muscular fibres may play an important rôle in causing a hernia of the cæcum has been confirmed by other writers. While concurring in this theory for some cases Hutchinson and Piersol were unable in some fœtuses to trace any direct connection between the *plica vascularis* and the cæcum.

3. When the cæcum descends to the iliac fossa as early as the fourth month adhesions may form between the cæcum

or appendix and the posterior parietal peritoneum covering the testis or gubernaculum. The subsequent descent of the vaginal process and testis will draw the cæcum into the inguinal canal, forming either a congenital or an infantile hernia.

That the descent of the cæcum within the abdomen is intimately associated with the descent of the right testis is further indicated by some cases of cryptorchids in which the cæcum is retained in the lumbar region and is connected with the testis by the plica vascularis.

By either the second or third mechanism, the cæcum may be drawn down to form a congenital sliding hernia of the intrasaccular or extrasaccular type.

Acquired hernia of the cæcum may be classified as (1) simple, and (2) gliding. The latter, called by the French "*hernie par glissement*," may be sub-divided into (a) the intrasaccular; (b) the extrasaccular or parasaccular; and (c) the sacless.

The simple acquired cæcal hernia is analogous to acquired hernia of small intestine or omentum. The herniated cæcum possesses an intact peritoneal coat and lies within the sac (Fig. 2). The cæcum, suspended from the colon, is free on all sides so that the finger introduced into the sac can be swept around its entire circumference. It is produced by the usual causes of hernia acting upon any one of the varieties of Robinson's "cæcum of potential position."

a. Gliding intrasaccular cæcal hernia may occur in two forms. In both the hernial sac is derived from the peritoneum of the abdominal paries; the cæcum possesses an intact peritoneal coat and lies within the sac. In the one variety the relations of the cæcum are the same as in the simple acquired hernia, except that its escape from the ring is due not to its "potential position," but to a ptosis of the colon and its attachments (Fig. 2). In the second form the cæcum is provided with a mesentery which appears as though inserted in the wall of the sac, and the circumnavigating finger encounters the obstruction caused by the mesocæcum along the interior of the posterior wall of the sac (Fig. 3).

FIG. 2.



FIG. 3.

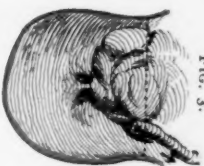


FIG. 4.



FIG. 5.

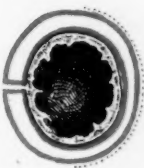


FIG. 6.

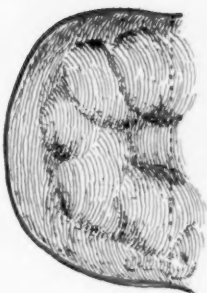


FIG. 7.

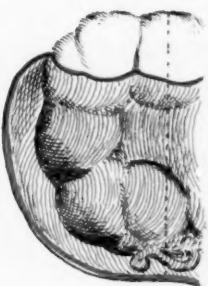


FIG. 1.

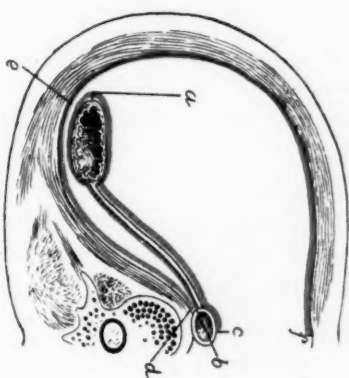
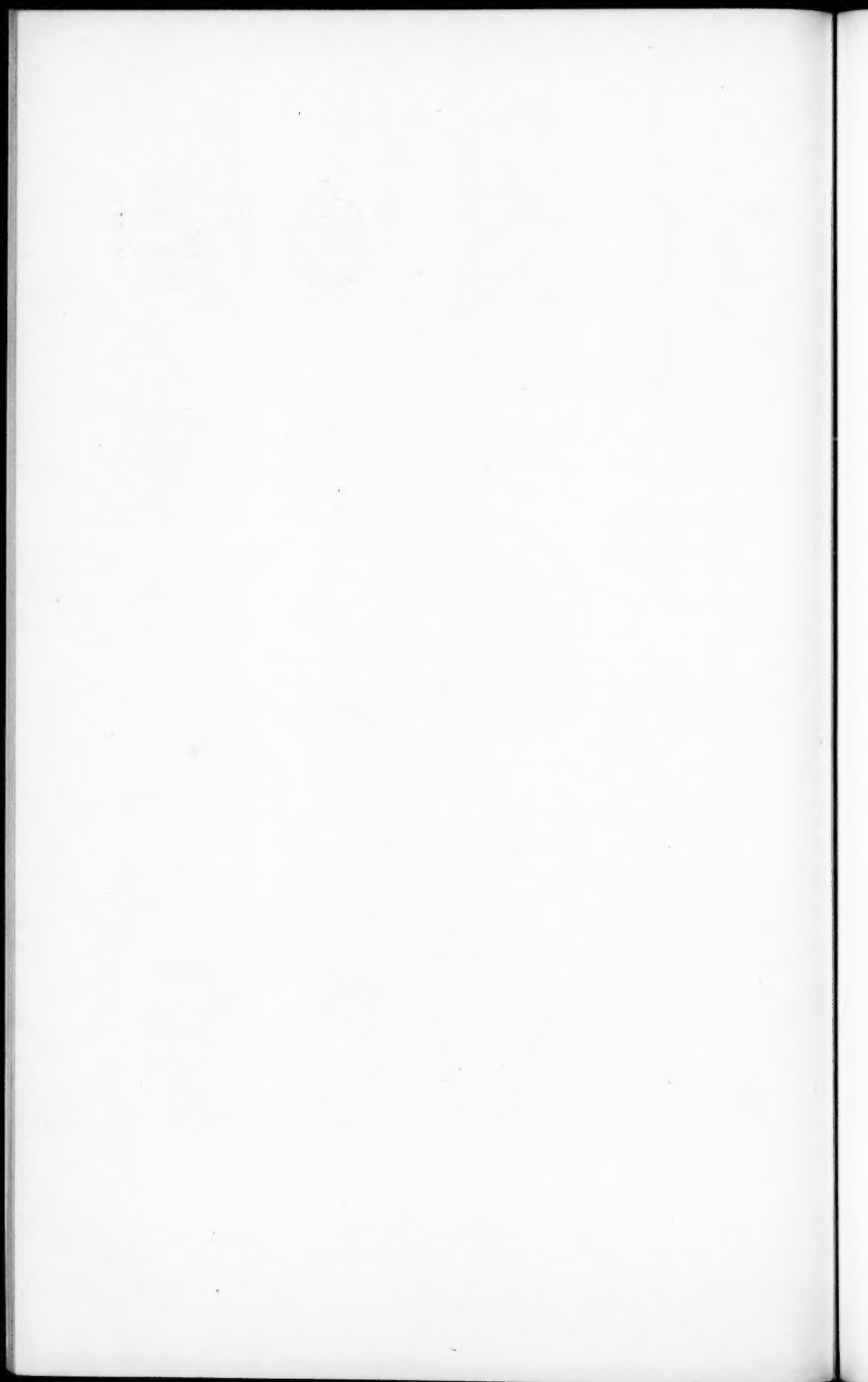


FIG. 1. Modified from Pietsol. By fusion between peritoneal leaflets *ab* and *cd* the colon becomes "retroserous." FIG. 2. Intra-abdominal hernia with free cecum. FIG. 3. Intra-abdominal hernia with mesocecum, the leaflets of the latter diverging to form sac wall. FIG. 4. Extra-abdominal hernia with cecum forming prominence on interior of sac. FIG. 5. Extra-abdominal hernia in which cecum is not readily apparent from interior of sac. FIG. 6. Extra-abdominal hernia of cecum and colon. FIG. 7. Extra-abdominal hernia of cecum and intra-abdominal hernia of cecum. In Figures 2 to 7 the dotted lines indicate the line of section in each companion diagram. The ileum is omitted to avoid confusion. Figures 2, 3, and 4 may represent progressive stages in the development of a hernia.



b. In the extrasaccular or parasaccular hernia the cæcum is not contained within the sac, but lies on the postero-external sac wall, and can be exposed at operation or autopsy without the necessity of opening the sac (Figs. 4 and 5). On its posterior and external walls the cæcum is entirely bare of its serous layer and lies in direct contact with the cellular tissues of the inguinal canal and scrotum. The peritoneal coat on the antero-internal surface of the cæcum forms the postero-external wall of the sac and is directly continuous with the remainder of the sac, which is derived from the peritoneum of the abdominal parietes. Necessarily the antero-internal surface of the cæcum is adherent to the postero-external wall of the sac. Because the sac does not surround the cæcum many writers erroneously assume that only a partial sac is present. A complete sac can be found in every case in front and to the inner side or above the cæcum. The size of the sac often is insignificant in comparison to the size of the hernia. A small sac may contain only one or two inches of the distal end of the ileum, whereas an enormous sac may contain almost the entire gastro-intestinal tract and omentum. The entire appendix may have either an intrasaccular or an extrasaccular position, or part of the appendix, usually the base, may be intrasaccular and the remainder extrasaccular. Inside the sac the appendix retains its peritoneal layer, but outside the sac its serous coat is wanting.

c. Sacless Hernia.—The cæcum may escape from the internal ring minus its own serous covering, absolutely free from any structure even remotely resembling a sac, and without producing a rent in the parietal peritoneum.

The gliding cæcal hernias are produced by a ptosis or downward gliding not only of the cæcum but also of the colon, its attachments and vessels, and the posterior parietal peritoneum. They all descend to a proportionate extent so that the base of the ascending mesocolon (Treves's transverse peritoneal fold) will be found lying in the lower iliac fossa, inguinal canal, or scrotum, constituting an obstacle to reduction. Baumgartner has shown that there may be in addition a

downward displacement of the kidney on the same side, due to its peritoneal attachment, and of the aorta and inferior vena cava, due to their vascular connection with the ptotic gut. Bennett and Cunningham observed one case in which the ureter was dragged forward. Tuffier has frequently noted nephroptosis associated with hernia of the large intestine.

The relation of the peritoneum to the cæcum in the hernia is chiefly determined by their relation to one another before escaping from the hernial orifice. In their usual intra-abdominal relation the cæcum is completely surrounded by peritoneum except at its attachment to the colon, and does not possess a mesocæcum. By slight descent of the colon there is produced an intrasaccular hernia in which the cæcum does not have any connection with the sac (Fig. 2). A cæcum which possesses a meso within the abdomen will retain it as it passes through the internal ring, and there is produced a cæcal hernia having a mesocæcum the two leaflets of which diverge from a point behind the cæcum to be continued as the peritoneum forming the wall of the sac (Fig. 3).

From a retroserous position a slight descent of the cæcum permits it to escape by its uncovered surface from the internal abdominal ring. If only the denuded portion of the cæcum passes through the ring, that portion of the cæcum will form a sacless hernia. If more of the cæcum escapes from the hernial orifice, one of two things occurs. The parietal peritoneum (particularly on the anterior abdominal wall) may have a firmer attachment than the peritoneum covering the cæcum, in which case the serous coat of the cæcum will be retained inside the ring when the cæcum passes through, thereby forming a sacless hernia of the entire cæcum and appendix. The alternate filling and emptying of the cæcum drags upon the peritoneum and aids in the denudation. On the other hand, and this occurs more commonly, the cæcum in completing its descent will be accompanied by the peritoneum covering its anterior surface and by the layer of peritoneum which was originally reflected from the cæcum to the abdominal wall, thus creating a sac with the cæcum on

the outside—in other words, an extrasaccular cæcal hernia (Figs. 4 and 5).

Instead of forming the primary constituent of an acquired intrasaccular or extrasaccular hernia, the cæcum may escape from the abdominal cavity secondarily in any one of three ways. (1) The distal end of the ileum forms the hernia primarily and by its further descent and direct pull upon the cæcum drags the latter through the hernial ring; or again a loop of small gut or omentum after adhesion to the cæcum may act in a similar manner. (2) A hernia of the small gut or omentum forms primarily, and as it increases in size the posterior parietal peritoneum with the colon and cæcum is dragged down to form the enlarging sac. The anterior parietal peritoneum is much more firmly attached to the abdominal wall than is the posterior parietal peritoneum; hence an enlarging hernial sac is provided at the expense of the posterior parietal peritoneum, which in turn drags down the cæcum, and the very large hernias on the right side are therefore prone to contain the cæcum. (3) The cæcum and colon may descend to such an extent that the posterior surface of the latter viscus may be the first part of the gut to escape from the hernial orifice. It thus forms an angle with the cæcum which will be dragged into the hernia by its colonic end (Tuffier's "*hernie par bascule*"). If it retain its serous coat the cæcum will occupy an intrasaccular position and the colon may be either intrasaccular or extrasaccular, depending upon whether it possessed a mesocolon or was extra-serous before it began its descent. If the serous layer become detached from the cæcum as the latter passes through the hernial orifice there will be formed, depending upon the extent of the denudation, a sacless or an extrasaccular hernia of the cæcum and colon. In the reported cases the cæcum and colon have been observed repeatedly forming a U-shaped loop within the hernia (Figs. 6 and 7).

The surgeons, starting with the fact that upon incising the external oblique they have seen the muscular wall of the gut absolutely bare of any covering and lying in direct contact with the cellular tissues of the inguinal canal, go on to theorize

that the muscular coat must have been bare on its extra-serous aspect in the abdomen. The anatomists, starting with the fact that they are always able to find two fused peritoneal layers surrounding the extraserous portion of the gut in the abdomen, propound the theory that these two layers must exist as a covering for the extrasaccular portion of the gut in the hernia. Going a step further Cavaillon and Le Riche maintain that it is possible to separate these two layers in the hernia in the same manner as is done in re-establishing the primitive mesentery in the abdomen, and by so doing the so-called sacless or extrasaccular cæcum will be found to lie completely within the sac and to have a complete peritoneal coat. All of the earlier anatomists and surgeons believed there was an unfolding of the peritoneal angle formed by the posterior leaflet of the primitive mesocolon (Fig. 1, *a*, *b*) and that portion of peritoneum lying posterior to it, whereby the colon and cæcum came to occupy a true "retroperitoneal" position. The unfolding was ascribed to the relatively less rapid growth of the peritoneum than of the colon itself (Treves, Macready), of the small intestine (Hutton), of the lateral walls of the abdomen (Luschka, Trietz), and of the right kidney (Waldeyer). Toldt was among the first to disprove this anatomical error on which the surgeons fixed their description of the mechanism of the production of the earlier cases of sacless and extrasaccular hernia.

So many surgeons have reported observations of the bare muscular wall of the large intestine in hernias that it seems incredible that all of them could have been mistaken. The proof by microscopical examination is wanting, but it seems fair to assume that such a condition may exist. On the other hand, the anatomists must be believed when they state that they always find the two fused layers of the peritoneum in the abdomen. The divergence of opinion arises when theories are formed, and inasmuch as the theories conflict with fact the theories need modification.

I have encountered cases in which the muscular structure of the cæcum was so plainly evident that it is inconceivable that

it was covered by more than a few isolated shreds of tissue, to say nothing of a layer sufficiently developed to permit separation either in practice or in theory. In other cases the muscular structure of the intestinal wall was not apparent and appeared to be covered by a layer of connective tissue which possibly might permit separation into two layers. In the latter instances it seems probable that the cæcum retained its two fused layers during its descent, while in the former they were lost, possibly due to firmer union with the abdominal wall than with the intestine, or possibly due to their being stripped off, together with more or less of the peritoneum covering the front and sides of the cæcum, during the passage through the ring, by a mechanism similar to that of sacless hernia. In those individuals in whom the cæcum arrives at the iliac fossa at a comparatively early period of prenatal existence retrocæcal fusion may occur so early that the fused layers are feebly developed and are more easily detached from the cæcum, thus furnishing a predisposing factor. In the cases of intrasaccular cæcal hernia in which the sac is formed in part by a mesocæcum (Fig. 3) the two leaflets of the latter may be separated and the cæcum forced out between them by pressure from within the sac.

It is possible even in an intrasaccular hernia in which the cæcum does not have a meso but in which the posterior aspect of the cæcal end of the colon is extraserous, and this applies particularly to a "*hernie par bascule*," that pressure of the sac contents may extrude the cæcum from the sac and the peritoneal coat will be stripped from the cæcum in the same manner as a glove on being turned inside out is stripped from the hand. More or less of the cæcum, beginning at its posterior colonic end, will be deprived of its peritoneal coat, which goes to form the enlarging sac.

Cavaillon and Le Riche believe that the vascular connections between the cæcum and its peritoneum are too strong to permit its peritoneal denudation; but this again seems to be theory, as their argument is confronted by those cases of sacless hernia in which the peritoneum has undoubtedly been stripped from the anterior surface of the cæcum. The only ar-

gument advanced to explain the sacless cases by writers who deny that the cæcum can ever be bare of peritoneum, is that the sac has become obliterated by inflammatory adhesions between the cæcum and sac wall. No doubt this may occur; but the alterations would be sufficiently gross to be apparent, or at least to be unmistakable for bare muscle fibres. The question of the relation of the peritoneum to the cæcum in sacless and extrasaccular hernia cannot be settled definitely until more detailed study is made of specimens obtained at autopsy or removed at operation. Microscopical examination of the excised appendix in certain cases ought to aid very materially in the elucidation of the subject.

About one-sixth of the reported cases of all varieties of inguinal hernia of the cæcum were found on the left side. The disproportion between the two sides is undoubtedly greater in actual practice, as many writers reported in detail single cases of left hernia and merely mentioned having seen right cæcal hernias. Foerster was able to collect 54 cases of left cæcal hernia in 1901. Fifteen of the patients were under 10 years of age and 25 were over 45 years; 46 were males, 4 females, and in 4 the sex was not stated. Double inguinal hernia was present in 9 patients. Strangulation was noted in 12 cases, incarceration in 4, and irreducibility in 15. Complications may have been present in some of the remaining cases, the details of which were very meagre. Adhesions were found in 12 cases, and their absence was recorded in 8. The presence of a sac was noted in 28 cases, but the records fail to show whether the cæcum was intrasaccular or extrasaccular. The presence of the cæcum in a left inguinal hernia was ascribed to enteroptosis, transposed viscera, congenital left-sided position of the cæcum, the presence of a primitive or a long definitive ascending mesocolon, elongation of cæcum incident to old age, adhesion of cæcum to small intestine or omentum, and peritoneal traction exerted by huge hernia of the small intestines. In one case of scoliosis and another of kyphosis the spinal deformity may have been an etiological factor.

Left sacless and extrasaccular cæcal hernias are rarities and doubtless are secondary to transposed viscera or congenital malposition combined with fusion of the cæcal to the parietal peritoneum.

Congenital and acquired, both simple and gliding (intra-saccular, extrasaccular, and sacless) left inguinal hernias of the sigmoid and descending colon are not uncommon. I have never seen a left herniated cæcum, but have encountered twice the descending colon in a simple left inguinal hernia, once the sigmoid in a sliding left inguinal hernia, and once a long loop of the large intestine in a sliding interparietal hernia through a split in the left internal oblique and transversalis muscles on a level with the crest of the ilium.

The relative frequency of the various forms of hernia of the cæcum is indicated by combining the statistics of Hildebrand and Gibbon, who have collected 139 and 63 cases respectively, only 4 of which are duplicated. Of their 198 cases 128 were right inguinal, 24 left inguinal, and 12 were stated to be inguinal without specifying which side; 21 were femoral, 18 being on the right, two on the left, and one not specified; and 11 were umbilical. There was one case each of sacro-sciatic and of ventral cæcal hernia. In a collection of 135 cases of cæcal hernia Koch found the cæcum completely intra-saccular in 108, of which 86 were right and 22 left, and extrasaccular in one left- and 28 right-sided hernias.

In 417 cases of herniotomy collected by Brunner the large intestine was in the hernia in 6 per cent. and the cæcum in 2.3 per cent. Bennett found the cæcum present in 9 instances (1.59 per cent.) in a series of 565 successive cases of strangulated hernia at St. George's Hospital. At the Hospital for Ruptured and Crippled, Coley found in 2200 hernia operations the cæcum alone in 18, the appendix alone in 10, and the cæcum and appendix together in 7. Macready collected 51 cases of hernia of the cæcum, of which 36 were right inguinal, 9 left inguinal, 5 right femoral, and one left femoral. Baumgartner in 1905 was able to collect 159 cases of sliding hernia. Of these 64 contained the descending colon or sigmoid or both,

and with the exception of one left femoral hernia all were left inguinal. Of 14 cases of pure appendiceal hernia 4 were right femoral and 10 right inguinal. In 81 cases the cæcum alone or in combination with other portions of the intestinal tract and omentum was found as the contents of strangulated right femoral hernia in 2; of left inguinal hernia in 2, one of which was strangulated; and of right inguinal hernia in 75, of which 34 were uncomplicated, 22 were incarcerated or strangulated, 9 presented other complications, and 10 were found at autopsy. Of the entire 159 patients only 10 were females.

Of 108 cases of sliding hernia operated upon since the introduction of antiseptic and aseptic surgery Baumgartner found that 71 recovered without accident or recurrence, 18 recovered after various postoperative complications, 10 had incomplete operation or rapid recurrence, and 9 died.

In addition to the cases collected by Hildebrand and Baumgartner instances of sliding cæcal hernia have been reported by Berger, Bennett and Cunningham, Braun, Horrocks, Lawrence, Pelletan, and Wormald.

Femoral cæcal hernia is generally found in the female sex. Of the 21 cases of Hildebrand and Gibbon, 13 were in females, 4 in males, and in 4 the sex was not specified. This hernia is always acquired, and the cæcum may be intrasaccular, extrasaccular, or sacless.

Inguinal hernias of the cæcum are found at all ages, but are more common at the extremes of life. Baumgartner's cases included 27 patients over 60 years of age. Of Hildebrand's 80 cases of right inguinal cæcocele 12 were children under one year of age and 2 were fœtuses at the eighth month.

Aside from congenital cases, hernia of the cæcum almost invariably develops slowly. Austin reports a very exceptional case of sacless hernia which he operated upon for strangulation 65 hours after the hernia made its first appearance.

The symptoms of hernia of the cæcum are not characteristic. More or less severe symptoms of intestinal obstruction are not infrequent. Strangulation is uncommon. Irreduci-

bility was noted in a large percentage of the reported cases. In actual practice the percentage is undoubtedly smaller, as the reducible cases frequently escape observation. Acute or chronic inflammation or strangulation of the appendix is a frequent complication. Hydrocele is occasionally associated. Bennett had a remarkable case complicated by intussusception of the ileum through the ileocæcal valve.

The existence of the cæcum and appendix within a hernia usually cannot be determined prior to operation, but a few cases have been reported in children and in adults with thin overlying tissues in whom these structures were demonstrable by palpation. Morestin has suggested taking a skiagraph after the administration of bismuth as an aid in the diagnosis. Coley found that in some of the congenital cases the hernia could be reproduced after reduction by traction on the testis. Differentiation between intrasaccular, extrasaccular, and sacless hernia is not possible except at operation or autopsy.

Those congenital cases of cæcal rupture in which the hernia can be made to reappear by traction on the testis should be operated upon early. The pressure of a truss is prone to produce trouble. Barring the possible presence of adhesions, the intrasaccular form of cæcal hernia, whether congenital or acquired, does not offer any special operative difficulties. Adhesions of the appendix frequently necessitate its amputation before the sac can be excised.

In congenital cases in which a prominent peritoneal fold is present on the posterior aspect of the hernia, great care should be exercised in separating it from the underlying spermatic vessels. Neglect of this precaution has resulted in sacrifice of the testis in several instances.

The possibility of the intestine being unprovided with any serous covering should be borne in mind constantly at every operation for hernia, otherwise the intestine may be opened inadvertently in a search for the sac. The surgeon usually recognizes the fact that he is dealing with an anomalous hernia shortly after splitting the external oblique muscle. In those cases in which the two fused peritoneal layers are wanting the

extrasaccular portion of the intestine is readily recognized by its bare muscular fibres. When the two fused layers are present the extrasaccular portion of gut might be mistaken for a thickened sac. In case of doubt the hernia should be examined at once from its peritoneal side. Writers on cæcal hernia almost unanimously advise, as a safe procedure, incision of the sac at the upper inner side of the cæcum. The sac usually is encountered at this point; exceptionally, however, it may be entirely absent or, as in some few reported cases, the extrasaccular gut after torsion may lie in front of the sac, or in other instances the condition may be one of extraperitoneal hernia of the bladder and the incision recommended might prove disastrous.

No single region is suitable for incision in every instance, and the surgeon must use discretion as to the best site for opening the sac in each individual case. If the sac cannot be absolutely identified the structures about the internal ring should be retracted sufficiently to permit incision through normal anterior parietal peritoneum, when the sac and its associated viscera can be explored from the abdominal side.

In sliding hernias the mesenteric attachments of the ascending colon described by Scarpa as "the naturally fleshy adhesions" frequently prevent reduction until they are stripped loose from the underlying cellular tissues of the scrotum or inguinal canal in the same manner as they are stripped from their normal position in the iliac fossa in exposing the ureter.

In some cases the line of cleavage is obliterated by inflammatory adhesions, rendering the mobilization of the gut extremely difficult. The blood-vessels supplying the colon, which originally coursed between the two leaflets of the primitive mesentery, will be found occupying an extrasaccular position on the posterior wall of the sac at the inner side of the colon. These vessels must be respected or the vitality of the gut will be jeopardized. If the separation of the gut and sac from the subjacent structures necessitates cutting it should be done at the expense of the cellular tissues and as far from

the vessels as is practicable. Some surgeons advise a herniolaparotomy for those cases in which the line of cleavage is indeterminate in order to begin the stripping from within the abdomen. No attempt should ever be made to dissect the sac from the cæcum.

Various methods have been proposed for dealing with the sac and extrasaccular intestine. Berger resects the sac and adjacent peritoneum and covers the denuded intestinal surface by introducing a few sutures to form a mesocæcum, the two leaflets of which are obtained by folding back the uncut parietal peritoneum at each side of the gut. Care should be taken to avoid the colonic vessels in passing the sutures through the inner leaflet. He then reduces the hernia into the peritoneal cavity and employs a stout suture to close the neck of the sac, which is drawn upward and secured by passing the ends of the suture through the deep muscles of the anterior abdominal wall (Barker method). Morestin does a herniolaparotomy, constructs a mesocæcum in the same manner as Berger, and performs an indirect colopexy by suturing the base of the leaflets to the iliac fascia.

In order to cover the denuded surface of the intestine, which at times is thinned out or may be damaged at operation, Van Heuverswyn, Morris, Gouillard and Raffin, Tuffier, Wier, and Singley advise forming flaps of peritoneum from the sac wall along each side of the gut, turning them back, and suturing them together along the posterior aspect of the intestine before closing the neck of the sac. By this method the weak part of the intestine is reinforced and the gut is entirely surrounded by peritoneum, so that after reduction it floats free in the peritoneal cavity, and in the event of further gliding the direction of the descent is supposed to be deflected away from the inguinal ring.

The method, however, has certain objections. Any attempt to employ it to cover the posterior surface of either the ascending or descending colon seriously endangers the blood-vessels which pass obliquely outward to the colon immediately beneath the peritoneum from which the inner flap is formed.

If the vessels escape injury during the requisite dissection they will be distorted by the turning back of the flaps. This objection does not apply when the plastic operation is confined to the cæcum itself.

When the colon or the cæcum and ascending colon form an intestinal loop in the hernia the blood-vessels lie between its two limbs and will escape injury if the one pair of flaps is made to cover both limbs of the loop, as in Morris's case, but the flaps then tend to hold the gut in its kinked position and may cause intestinal obstruction after reduction. Transplantation of peritoneal flaps whether on the cæcum or the colon or both lessens but does not abolish the risk of perforation; and if infection from damaged gut or perforation does occur it is sure to be intraperitoneal, where otherwise it probably would be extraperitoneal.

Jaboulay, in the "*hernie par bascule*," reduces the colon first and then the cæcum, this being in the reverse order of their descent. Roussel at autopsy and Savariaud at operation saw the mesocolon reform from the peritoneum of the sac wall after reduction of the colon into the abdomen. Their experience indicates the advisability of preserving all the sac in moderate-sized hernia and doing only a partial resection in cases of very large sac.

Recurrences following operation have happened so frequently that some authors advise castration in order to make complete closure of the hernial canal, and others advise herniolaparotomy to permit of direct colopexy. Other surgeons point out that Barker's method of dealing with the sac as employed in these cases by Berger serves to suspend the colon, through its intimate attachment with the peritoneum at the neck of the sac. In many cases the redundant part of the sac was excised, the peritoneum closed by suture or ligature, and the extrasaccular loop simply reduced into the abdominal cavity, with retention of its extraserosal position, with a happy result.

Dense adhesions and operative complications, particularly hemorrhage, have led many competent surgeons to refrain

from complete reduction of sliding cæcal hernia in several instances.

Gangrene of the bowel may necessitate resection of the cæcum, colon, or small intestine. Appendectomy, if indicated, should be performed after the sac and intestine are mobilized in order to prevent the tearing out of the intestinal suture.

No single method of dealing with the sac and intestine is applicable for all cases, and the surgeon must be guided in making his choice by the conditions in each individual patient. The sacless hernias are always small, but usually it is possible, if deemed advisable, to secure a peritoneal covering by slight modification of Berger's method of forming a meso for extra-saccular hernia.

After reduction the parietal wound may be closed by any of the usual methods applicable for inguinal hernia.

REPORT OF CASES.

CASE I.—Male patient, 38 years of age, admitted to University Hospital, May, 1905. Hernia accidentally discovered during childhood. Irreducible past 10 years. Sudden painful increase in size 48 hours before admission.

On examination presented right oblique inguinal hernia, size of cocoanut. Irreducible. Dull on percussion. Sac contents chiefly thickened omentum, which was excised. Testicle occupied bottom of sac. Appendix and lower half of cæcum adherent along posterior wall of sac. A thickened fold of peritoneum and fibrous tissue extended from tip of appendix to point on sac wall near testis. Appendix excised. Lower portion of sac preserved as tunic for testis, remainder resected. Normal convalescence. When seen one year later no sign of recurrence and constipated habit present before operation relieved.

CASE II.—Male, Russian. Age, 34 years. Admitted to Philadelphia Hospital, March, 1907. Reducible right oblique inguinal hernia of several years' duration. Percussion note dull in scrotum, tympanitic at external ring. Sac contents: anteriorly omentum, posteriorly non-adherent cæcum and appendix. Postoperative phlebitis of pampiniform plexus, otherwise smooth course.

CASE III.—Male, aged 57 years. Admitted to Philadelphia Hospital, January, 1908. Reducible right indirect inguinal hernia

of 6 years' duration. Sac contents: thickened omentum, cæcum, and appendix adherent to one another but not to sac. Adhesions too extensive and firm to permit ready separation and were not disturbed. Two fenestrations formed by adhesions between omentum and cæcum were closed by omental sutures to guard against internal hernia. Normal convalescence.

CASE IV.—Male, 58 years. Laborer. Admitted to Phoenixville Hospital, June, 1908. Large bilateral oblique inguinal hernia. Left hernia for 39 years following fall from horse. Right hernia appeared several years later. Constipated for years. Left acquired hernial sac contained small intestine. Right sac contained omentum, cæcum, and appendix, which were adherent to one another and to sac wall, and a short loop of non-adherent small intestine. Excision of sac. Constipation relieved.

CASE V.—Fireman, aged 35 years. Admitted to Philadelphia Hospital, February, 1908. Reducible right oblique inguinal hernia. Sac contents: omentum, which was excised. An apparent thickening or fatty cord on posterior wall of sac on closer examination proved to be appendix, the peritoneal layer of which was reflected at each side to form part of sac wall. Tip of cæcum presented at internal ring and was extrasaccular. Appendectomy. Resection of sac. Slight superficial wound infection.

CASE VI.—Laborer, aged 38 years. Admitted to Philadelphia Hospital, June, 1904. Right oblique partially reducible hernia. On splitting external oblique cæcum and appendix exposed without opening sac. Lower end of colon and cæcum arranged in curve, convexity downward, with tip of cæcum directed toward median line. Inferior surface of cæcum and colon and all of appendix except one-half inch of its base entirely bare of serous covering. Muscular fibres of intestinal wall distinctly visible. No sac discoverable at this stage of operation. Forcible retraction of internal oblique and transversalis. Incision into anterior parietal peritoneum for digital exploration of sac. Finger entered small pouch or sac formed in part by serous coat of undenuded portion of the cæcum and lower colon and in part by the layer of peritoneum reflected from these viscera onto abdominal wall. Rudimentary sac was very minor part of hernia and was surrounded on its lateral and inferior aspects by colon and cæcum. Sac contained one-half inch of base of appendix and two inches of ileum. Ileum and intrasaccular portion of appendix possessed

normal serous coat. Further search for sac futile. Reduction of intestine caused unfolding of bend between cæcum and colon with obliteration of small sac containing ileum and appendix. Exploratory peritoneal wound closed with catgut. Convalescence normal.

CASE VII.—Fireman, aged 34 years. Admitted to University Hospital, April, 1906. Reducible right oblique inguinal hernia for 16 years. Onset of violent symptoms of strangulation six hours before operation. Hernia size of child's head. Constriction at external ring. Sac opened. Two feet of ileum intensely congested, thickened, and almost black. Bloody serum oozed copiously from strangulated loop, which was returned to abdomen. Drainage tube inserted through right rectus stab puncture two inches above pubis. Cæcum extrasaccular and destitute of serosa over greater part of its circumference. Appendix fully extended with tip projecting below external ring but not adherent to testis. Meso-appendix stretched out on each side of appendix and formed part of sac wall. Appendectomy. After suture of peritoneal opening cæcum remained lying in inguinal canal. Cæcum reduced. Free sero-bloody discharge from drainage tube. Absolute constipation for five days, then frequent stools of decomposed blood for three days. Recovery. Returned to work. Died one year later of heart lesion. No recurrence. No autopsy.

CASE VIII.—Coachman, aged 56 years. Admitted to Philadelphia Hospital, February, 1907. Huge bilateral indirect inguinal hernia. Left hernia duration 16 years, right 6 years. Truss treatment ineffective. Mild symptoms of incarceration for 48 hours. Right hernia tense and tympanitic and resisted taxis for several minutes. Left hernia considerably larger, but responded more readily to taxis. Complete reduction impossible due to lack of intra-abdominal space. Preliminary treatment by diet and by bandaging hernias. Simultaneous operation. Dr. Edward Martin operated on left hernia, which was composed of small intestine and aside from large size presented no unusual features.

On right side hernial sac contained appendix and small intestines. The cæcum and a loop of small intestine extrasaccular. Cæcum occupied position outside postero-external wall of sac. The extrasaccular loop of small gut encircled the exterior of sac midway of its lateral borders, passing around its posterior wall, fundus, and anterior wall. About three-fifths of the circumfer-

ence of this loop of small intestine was devoid of serosa, but remaining two-fifths was normally covered by its peritoneal tunic, and the latter formed part of the sac wall. The portion of sac wall lying between cæcum and extrasaccular small gut excised and margins of opening sutured. The extraserous cæcum and small gut returned through the wide internal ring but great intra-abdominal tension caused their repeated prolapse and occasioned some embarrassment in placing the deep parietal sutures. Normal convalescence.

CASE IX.—Male, alcoholic, aged 60 years. Operation Philadelphia Hospital, May, 1905. Reducible direct right inguinal hernia of 18 months' duration. After division of external oblique and conjoined tendon the cæcum, appendix, and posterior lower end of colon, entirely free from any tissue covering their muscular wall, came into view. No sac discoverable. Examining finger passed through an exploratory incision in anterior parietal peritoneum failed to find any abnormal depression, plait, or fold in the peritoneum at any point in the vicinity of the ring. The peritoneum preserved its usual relation at the ileocolic angle, but from all other sides of ileum it passed directly to the abdominal wall. Ileum presented fallacious appearance of being inserted in anterior abdominal wall at the internal ring. Herniated cæcum was absolutely free from any adhesions and was easily reduced into abdominal cavity, but remained extraserous. Edges of exploratory peritoneal incision closed with catgut.

Remarks.—With the exception of Case IV all of the above patients were treated on the service of Dr. Edward Martin, to whom I am indebted for the privilege of operating upon them and of reporting them.

In none of the cases was the diagnosis of cæcal hernia made before operation. In a few other cases an appendix-like structure could be palpated, but at operation it was found to be a thickened strand of omentum.

In Case V the cæcum could scarcely be regarded as forming part of the hernia, but the case is of interest in connection with this subject and is included as a case of intrasaccular appendiceal hernia. The cæcum was extraserous and its further descent would have produced an extrasaccular

cæcocele. Microscopical examination of the excised appendix revealed a normal arrangement of its peritoneal coat.

Case I is an example of congenital sliding hernia; Case II is simple acquired (intrascaccular) cæcocele; Cases III and IV of acquired sliding intrascaccular cæcal hernia; Cases VI, VII, and VIII of acquired sliding extrascaccular cæcal hernia; and Case IX of sacless hernia. In all of the cases the parietal wound was closed by the Bassini method. In two of them (Cases IV and VI) the edge of the rectus muscle was sutured to the edge of Poupart's ligament to assist in closing the muscular defect. So far as known there have been no recurrences. Case IV in January, 1909, presented a bulging in the inguinal region due to muscular weakness or relaxation, but there was no true hernial protrusion.

Case V illustrates the need for care in applying the ligature at the neck of the sac. In every hernia operation the surgeon should bear in mind that the appendix, cæcum, or bladder may occupy a position where it is endangered by the proposed ligature, without causing any prominence on the interior of the sac, and on its exterior might easily be mistaken for fatty tissue. Forcibly dragging down of the peritoneum at the internal ring increases the danger of damage to these viscera.

In Case VII the changes due to strangulation of the intestine of only six hours' duration were most profound. On the fourth day the advisability of a second operation was seriously considered, but the threatening symptoms subsided the following day and convalescence was uninterrupted after evacuation of several stools composed almost entirely of decomposed blood.

Case VIII is noteworthy as it appears to be the only case on record in which a loop of small intestine, other than that immediately adjacent to the cæcum, has occupied an extrascaccular position. This loop may have been extrascacular before entering the hernia, or its mesentery may have been unfolded at a later period by pressure from the gradually enlarging hernias.

In Cases III and IV the extensive dense adhesions probably resulted from appendicitis, although no history of an acute inflammatory attack could be obtained. The absence of adhesions to the sac in Case III is suggestive of the inflammation having preceded the hernia, in which case the more mobile omentum may have been an active factor in causing herniation of the cæcum.

In Case IV the extensive adhesions to the sac seemed to indicate their formation subsequent to the development of the hernia. There was partial obliteration of the sac cavity, due to adhesions between cæcum and sac wall; but even though such adhesions might cause total obliteration of the sac cavity it would not be mistaken for true sacless hernia as suggested by some anatomists. The obscured outlines of the appendix as seen through the overlying adherent peritoneum of the sac wall offered a startling contrast to the denuded appendix, as seen in Cases VI and IX. Another argument against the theory of adhesions between sac wall and the underlying viscera being responsible for the changes present in sacless hernia is afforded by Case VI. The intrasaccular portion of the appendix which possessed its normal peritoneal covering and was not adherent to the sac wall had a larger diameter than did the extrasaccular portion which had been deprived of its peritoneal tunic. Had the extrasaccular appearance been simulated by adhesion between sac and appendix this portion of the latter would have been covered by two fused layers of the peritoneum and presumably would have had a greater diameter than the intrasaccular portion covered by only one layer.

Case IX is an undoubted instance of true sacless hernia.

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HERNIA OF THE VERMIFORM APPENDIX.

WITH AN ACCOUNT OF FOUR CASES.

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WHILE not a rare condition, hernia of the appendix is perhaps sufficiently uncommon to render of interest an account of four cases which have come under the writer's notice. Various theories have been put forward to account for the occurrence of the condition. Thus Lockwood mentions that the gubernaculum testis is sometimes attached above to the cæcum and vermiform appendix, and it is reasonable to suppose that such an attachment would tend to produce an inguinal hernia of the appendix. Probably also in these cases the mesocæcum has been unduly lax, while a mesocolon may also have existed, thereby giving the large bowel a much greater range of movement than it normally possesses. In all of the cases to be reported the patients were of the male sex, and in three of these the condition was certainly present at or soon after birth, while in the fourth case the early history is quite indefinite. In all, likewise, the hernia was of the right inguinal variety. It is further interesting to note that the appendix presented a more or less abnormal condition in all of the cases, and that some argue that suppurative processes are particularly prone to occur in the appendix when in the scrotum, because the stagnation of its contents when so placed gives rise to a lowered vitality of its walls, and because of interference with its circulation due to the position, possible tightness of the rings, or the use of a truss. While this is probably true to an extent, there are others who think that the presence of the appendix in a hernial sac is due to its having previously been affected by appendicitis, and to its having contracted adhesions during the process.

The appendix may either descend alone into the scrotum,

or it may simply accompany the cæcum. Where the appendix is present alone in the scrotum, it may give rise to a characteristic condition. Examination at the neck of the scrotum reveals either the presence of what appears to be a thickened cord, or even a double cord; while the extremity of the appendix lying curled up above the upper extremity of the testicle, together with its thickened mesentery, may simulate a second testicle. A much thickened and fat-laden condition of the mesentery of the appendix, when present in hernia, is said to be characteristic, and it certainly was marked in two of the cases to be recorded. A marked thickening of the sac wall opposite the lower extremity of the appendix was met with in two of the cases and may have been due either to an encysted type of infantile hernia with fusion of the two layers of sac, or to inflammatory thickening.

CASE I.—The first case to be recorded, that of a male child, six months old, is typical of a hernia of the cæcum rather than of the appendix alone. The swelling was first noticed by the mother a few weeks after birth, when it was about the size of a marble and was reducible. Two months prior to admission, however, the swelling began to increase in size, and was only reduced with difficulty, while the child became very cross and irritable. A truss was tried, but failed to improve matters.

The child having been admitted to the Elder Hospital under my care, an operation as for the radical cure of hernia was commenced, and the hernia found to be of the congenital type, with a large sac. On opening the sac a considerable mass of bowel presented, which on inspection was found to consist of the lower end of the ileum, ileocæcal valve, and cæcum. The appendix, which was also present, was abnormally long for a child, fully four inches in length, and was lying lengthwise along the cæcum, to which it was rather closely bound by adhesions. One or two small tubercular nodules were present in its mesentery, and the mesenteric glands were markedly enlarged. In this case there was no adhesion between appendix and testicle, although no sac wall intervened between them, the tip of the appendix being turned upwards toward the abdomen and away from the testicle. If therefore the gubernaculum acted in this case in producing the hernia, it must have acted on the cæcum and not on the appendix.

The appendix was freed from adhesions and removed, the stump being umbilicated by a purse-string suture; and then the radical cure of the hernia by Macewen's method was proceeded with. Patient made an uninterrupted recovery.

CASE II.—The second case was that of a boy, three years of age, who was admitted under my care to the Elder Hospital, Govan. Here the history definitely states that a swelling was present in the right scrotum at the time of birth, which the doctor advised should be operated on when the child grew older. While the swelling possibly decreased in size while the child was in bed, it was never entirely reducible. Six months prior to admission, the child became unwell, was irritable, and complained of pain over the swelling, which began to increase in size, and a further increase took place shortly before admission.

On examination after admission the right side of scrotum was found very considerably distended. At the bottom the testicle was plainly distinguishable, while above it, and apparently connected with it, was a large spherical mass, about the size of a walnut, which did not yield an impulse on coughing, and which was thought possibly to be an encysted hydrocele of the cord, prior to applying the light test. Still further up, and extending into the abdomen, was a swelling which masked the cord and yielded a slight impulse on coughing.

As the mass was large and not entirely reducible, the "hydrocele" part remaining in the scrotum, and as the history stated that the mass was increasing in size, operation was determined upon.

An incision as for the radical cure of hernia was made, the sac exposed in the upper part of the scrotum and opened, and the contents examined. It was immediately noticed that the peritoneal sac wall was thickly studded with minute tubercles, while the contained mass consisted of matted tissue, covered with granulations which oozed blood very freely when touched, and which rendered the parts unrecognizable at first. After separation of numerous adhesions, however, it was found that the mass consisted of a loop of intestine. This was pulled more thoroughly down from the abdomen, and the fresh portion so exposed was also found covered with thick shaggy masses of tubercular granulations. Only after very careful examination was it determined that the portion of bowel exposed consisted of the lower end of the ileum and caput cæci, so altered were the parts in appearance

by the granulation masses growing from their walls. Attention was now directed to the "hydrocele" portion of the swelling, which was found to be directly continuous with the upper portion just described, and which possessed a much thicker sac wall than the rest of the hernia. This thickened sac, however, was directly continuous with the upper and thinner ordinary peritoneal sac. The contained mass was found after considerable careful dissection to consist of the appendix, much thickened and inflamed, but not attached to the testicle. The appendix was removed in the ordinary manner after it had been freed of its adhesions, the bowel after similar treatment was returned to the abdomen, and then the radical cure of the hernia by Macewen's method was performed.

The patient made an uninterrupted recovery and was dismissed well.

In this case the thickened sac wall was probably due to the hernia being of the infantile encysted type, the inner evaginated septum having fused with the outer sac wall proper. This thickened wall separated the appendix from the testicle, and it is difficult therefore in this case to see how the gubernaculum could have acted in producing the hernia of the appendix.

CASE III.—The third case was that of a man aged twenty-five, who was admitted to the Elder Hospital under my care, complaining of a swelling in the right scrotum which he first noticed a few days previously, his attention having been directed to the part by a sensation of something slowly giving way when he was lifting a heavy weight. On examination a firm rounded swelling about the size of a walnut was found situated just above the testicle and apparently connected with it. As in the last case this swelling was found to be opaque to transmitted light, hydrocele of the cord thereby being eliminated, and it was not markedly tender to pressure. The vas could not be satisfactorily isolated, as a thick cord ran up from the mass just described into the abdomen through the inguinal canal. There was no impulse on coughing either over the rounded mass just above the testicle or in the thick cord-like structure. A large and rather prominent scar over the inguinal region and upper portion of the scrotum attracted attention, and patient explained that this was left by an operation for rupture which he underwent in infancy. As the present condition was causing patient trouble and unfitting him for work, operation was decided on.

The parts were exposed by an incision as for radical cure of hernia and a small mass of matted omentum found, no sac wall being apparently present. On opening out this mass the appendix was found within it. The appendix extended from the internal ring to the testicle; it was curled on itself toward the tip and was firmly adherent at this part to the upper portion of the testicle. The adhesion to the testicle was dense and avascular, was obviously of long standing, and necessitated cutting to effect a separation. The mesentery of the appendix was thick and loaded with fat. The appendix having been freed from the adhesion to the testicle and from some lesser ones to the inguinal canal, the lower end of the cæcum was brought down by employing gentle traction and using the finger as a hook. The appendix was then removed as in the other cases and the bowel returned to the abdomen, after which the radical cure was performed by Macewen's method. Patient made an uninterrupted recovery and resumed work two months after leaving hospital.

In this case it was thought probable that the appendix had long occupied the inguinal canal, unknown to patient. The attachment to the testicle might be due either to inflammatory mischief or to the gubernaculum. The absence of sac might be due to the previous operation or to suppuration (see below), but the presence of the adhesion between appendix and testicle would suggest that it had been of the congenital type. The sensation of something giving way which the patient described on admission was probably due to the slipping down of the small omental mass which was found enveloping the appendix.

Reference to the journals of the institution in which patient was operated on when an infant some twenty-three years previously showed that he was twenty months old at the time of the operation. A swelling in the groin was noticed from the time he was ten months old, and a truss was worn until the week of admission to the hospital, when it was discarded, as the swelling became red and painful and descended into the scrotum. It increased in size until, on admission, it was pear-shaped, extending above to the inguinal canal, while the lower portion in the scrotum was hot, red, and tender. There was impulse on coughing, but taxis was not successful. On laying the tunica vaginalis open, pus flowed out, after which the bowel was returned with a slip and gurgle, and the pillars of the ring were brought together

by a silver stitch which was removed later. Free drainage was provided and frequent lavage was performed.

From the description given in these old notes it would appear that the patient had a hernia of the appendix from a very early age, and that, when twenty months old, he had an attack of suppurative appendicitis with abscess formation in the tunica vaginalis. Probably in opening the abscess and returning the bowel to the abdomen, the appendix was overlooked, and was left to drain through the open wound, until it gradually healed up. If this surmise be correct, we have here an example of mural implantation of the appendix, probably the first on record, and it must be admitted that, so far as the appendix was concerned, the result was thoroughly satisfactory.

CASE IV.—The fourth case, that of a man aged sixty-two, was not operated on by me, but was sent into the Glasgow University Surgical Clinic as a case of strangulated hernia. Sir William Macewen, whom I assisted at the operation, kindly permitted me to report the case. Patient's history was unsatisfactory. He stated that he strained himself severely twelve years previously when lifting a sack, and that a swelling then appeared in the right inguinal region. This swelling was small but so painful as to necessitate his taking to bed. Notwithstanding the rest in bed it increased in size until a week after the onset, when it became red and tender, after which it gradually subsided. He then wore a truss, which enabled him to perform his work in comparative comfort until two weeks prior to admission. He then began to suffer considerable discomfort, which he at first attributed to the truss, but which increased in spite of rest in bed until distinct pain was experienced. Three days prior to admission he took a dose of salts which acted very thoroughly, but, as the pain still increased, he sought admission to the hospital.

On examination patient's general condition was found very unsatisfactory, both cardiac and respiratory systems being defective, while he looked much older than his age. The right inguinal region and scrotum were occupied by a large pyriform swelling which was firm in consistence and dull to percussion, while the scrotal tissue was much inflamed. The testicle appeared to be fused with the mass, but the swelling and tenderness were too great to permit accurate palpation of the parts. Although movable, the swelling was, fortunately, not reducible. Pulse and temperature were normal.

On incising over the part, the mass was exposed and found to consist externally of a thick layer of matted, omental-like tissue, which was much congested, and presented a dark purple, mottled appearance. It was adherent below to the testicle, which, like the mass, was much inflamed. This mass was next opened, when it was found to be a sac, containing a second sac within it. This second sac was of globular shape, and composed of thick, dense, fibrous tissue, which, when traced upwards toward the inguinal canal, was seen to be continuous above with the normal peritoneum. There was a slight constriction at the line of junction between thickened sac and normal peritoneum. The inner sac, having been freed from adhesions, was then opened, and was found to contain the thickened and inflamed appendix. Here, as in the previous case, the mesentery of the appendix was hypertrophied and laden with fat. The appendix not coming readily out of the sac, and something hard, like a piece of wire, being felt inside, the sac was incised along its anterior surface to the base and opened up. It was now found that the appendix was held in position by a pin, the point and half the shaft projecting through a small ulcerated aperture in the wall of the appendix. The pin was directed upwards and was engaged at the point in the thick fibrous sac, which was also slightly ulcerated at the point of penetration. The point of the pin having been disengaged from the sac, the appendix was freed from some slight adhesions and lifted out. On applying slight traction the colon was now brought down into view, and the appendix was then removed in the ordinary manner. As the colon and all the surrounding tissues were markedly inflamed it was decided not to proceed with the radical cure of the hernia. The bowel was returned to the abdomen and both inner and outer sacs were removed, after which the wound was stitched up. The patient made an uninterrupted recovery.

With regard to the variety of hernia which was present in this case, the presence of the double sac suggests the probability of its being an infantile encysted type. Careful endeavor was made to ascertain how long the pin had been in the intestinal canal, but without success. As the surface was but little corroded, it probably had not been long in the intestine. It would appear probable that its entrance into the appendix two weeks prior to admission caused the increasing discomfort of which the patient complained.

As in the last case, the abnormal position of the appendix undoubtedly tended to protect the patient, as, had such a perforation occurred in the free peritoneal cavity, there can be little doubt but that peritonitis would have been set up. This case also may therefore be said to afford an argument in favor of mural implantation of the appendix, although, of course, it is open to question how far the abnormal position of the appendix in each of these cases contributed to the pathological condition.

So far as I can ascertain, only a comparatively small number of cases of perforation of the appendix by foreign bodies while in the scrotum have been reported. Symonds reports in the *Transactions of the Clinical Society of London* (vol. xxxii) the case of a female aged eighteen, who had a swelling of three years' standing, which began to give trouble a week prior to admission to hospital. The swelling resembled an inflamed gland, but on operation was found to consist of the appendix perforated by a pin. Roberts of Louisville reports a case of perforation of the appendix by a pin, but I have been unable to get details of the case. Hutchinson in the *British Medical Journal* of 1899 mentions a case of perforation of the appendix by a hard spicule, and Broughton and Hewetson report a case of femoral hernia of the appendix, with suppurative appendicitis due to a pin, in the *Lancet* of 1906.

Of course foreign bodies such as pins and needles are not infrequently met with in the appendix while in its normal position, which may cause perforation and give rise to peritonitis; and the occurrence of such cases, together with the great frequency of ordinary suppurative appendicitis when the appendix is in its normal position, would seem, to an extent at least, to negative the supposition that the appendix when fixed in the scrotum is thereby much more prone to pathological changes than when normally situated.

Not merely has the appendix been found in right inguinal and in right femoral herniæ, it has even been found in left-sided herniæ. Possibly developmental peculiarities may again account for the latter form, the large intestine occupying the left side of the abdomen during a period of fetal life.

CYSTIC DILATATION OF THE VERMIFORM APPENDIX.

FROM THE PATHOLOGIC LABORATORY OF THE PHILADELPHIA POLYCLINIC HOSPITAL AND COLLEGE.

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THAT cystic dilatation of the vermiform appendix is a rare condition may readily be seen when we consider that Stengel was able to collect from 9108 autopsies only 28 examples, or .3 per cent. These statistics were compiled from the following records: Steiner 2286 autopsies, 3 cases; Ribbert 400 autopsies, 6 cases; Bryant 124 autopsies, 1 case; Boody 528 autopsies, 1 case; Kelly and Hurdon 3770 autopsies, 16 cases; Stengel 2000 autopsies, 1 case. Kelynack says, "I have met with only one well-marked case of cystic appendix in an examination of several hundred cases during the past two years. No such cases are recorded in our Post-mortem Records."

After a careful review of the literature I have been able to add forty-three cases to these twenty-eight cases; and to these I wish to add one case on which this report is based. This case was observed at autopsy held in the pathologic laboratory of the Polyclinic Hospital on a case from the service of Dr. David Riesman, to whom I am indebted for the clinical notes on the case.

CASE RECORD 14006.—M. W., aged 43 years, married, colored, porter. Admitted to the medical wards April 1, 1907. Admitting diagnosis: chronic diffuse nephritis. Patient died April 7, 1907. Diagnosis: acute nephritis; uræmia. (Addendum. No history of appendicitis was given by the patient. During the physical examination there was no suspicion of the large mass afterward found in the abdomen.)

At autopsy, in addition to the kidney changes which had been appreciated before death, the following condition of the appendix vermiformis was revealed.

The cæcum is drawn over to the median line and toward the pelvis by a cystic dilatation of the appendix, which occupies the pelvis and projects upward and to the right in the ileocæcal region of the abdomen.

The specimen consisted of a cystic dilatation of the terminal portion of the appendix, having the shape of a banana, and the size of a large one, occupying the pelvis, with its proximal part toward the rectum and its distal portion pointing upward, forward and to the right into the ileocæcal region. The proximal portion of the appendix was represented by a cord about 3.5 cm. in length, the lumen of which was entirely obliterated. It rested posteriorly in the pelvis and caused marked dislocation of the head of the cæcum toward the median line. There were no adhesions connecting the appendix with any of the neighboring structures. There were no signs of an acute inflammatory process taking place. The cyst measurements are as follows: length, greatest curvature, 30 cm.; greatest longitudinal, 16 cm.; circumference, largest, 15 cm.; smallest, 13 cm.; walls, thickness, $\frac{1}{4}$ mm.; proximal obliterated portion, length, 3.5 cm.; meso-appendix extends to within 5 cm. of tip of cyst. Peritoneal surface shows marked congestion of vessels. Cyst is tense, fairly firm, and slightly fluctuant. On section there is no vestige of mucosa or submucosa. The walls are semitransparent and the inner surface is generally smooth, excepting at both ends, where there is moderate roughening and adhesions of fatty crystals and lime salts. The contents consist of a whitish-yellow, granular débris, which is in places of a yellowish, jelly-like, mucoid, gelatinous, viscid character.

Microscopic Examination of Cyst Wall and Contents.—The cyst wall shows mucosa absent, and replaced by fibrous tissue and scattered areas of calcification. In the submucosa there are a few flattened and atrophic lymph-follicles. Serosa and muscularis are thickened and fibrous. Cyst contents show absence of definite structure, and are made up mainly of lime salts, fatty crystals, cholesterin and granular débris. No epithelial cells, leucocytes or bacteria present. Cultures taken were negative.

Historical Considerations.—Various terms have been applied to the pathologic changes which take place in cystic dilatation of the appendix. Féré was the first to apply the

term retention cyst, hydrops or mucocele to that portion of the appendix in which dilatation had occurred. The condition was first recognized by Virchow and he considered his case as one of colloid degeneration of the appendix. Since his time cases, while very infrequent, have been reported by various authorities. Most of these cases have been found during the course of operations performed on neighboring structures, and rarely for disease of the appendix itself. Many have been found during the course of a routine examination at the autopsy table. That the condition is infrequent is shown by the statements of Landenberger and others. He states: "The occurrence of cystic dilatation of the appendix is manifestly rare considering the vast number of appendectomies yearly, with the few reports of such an occurrence. Of the many surgical text-books treating on appendicitis only a few devote any space to this condition."

Etiology.—In a study of the etiology of cystic dilatation of the appendix there are a number of factors to be considered. The condition may be due to obliteration of the lumen of the appendix from internal or external lesions. Among those of internal origin may be cited: direct obliteration of the proximal end as a result of previous inflammatory changes, stenosis of Gerlach's valve, impacted fecal concretions, etc. Of the external causes there may be mentioned: angulations, adhesions causing kinking, obstruction due to bands, etc.

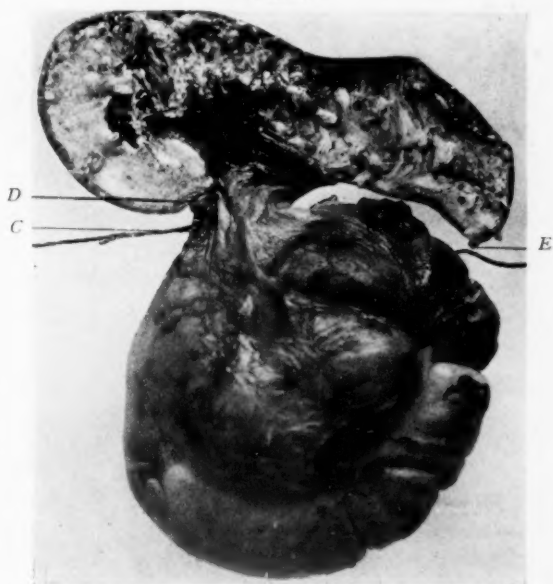
Ribbert in formulating the changes which take place in an appendix where cystic dilatation occurs, states as follows: "In the lesser degrees of dilatation we see no essential alteration in the composition of the wall. Later, abnormalities of the epithelium occur; it is lost, together with the glands, throughout considerable areas, and forms in other parts a covering for a single layer without glands, which still, however, may be present in patches; in very great dilatation it may be destroyed altogether, but disappears when dilatation is slight. We must, however, take into consideration that the loss of the epithelium does not need to be the result of dilatation, but that it may be destroyed by the disease process, which led to

FIG. 1.



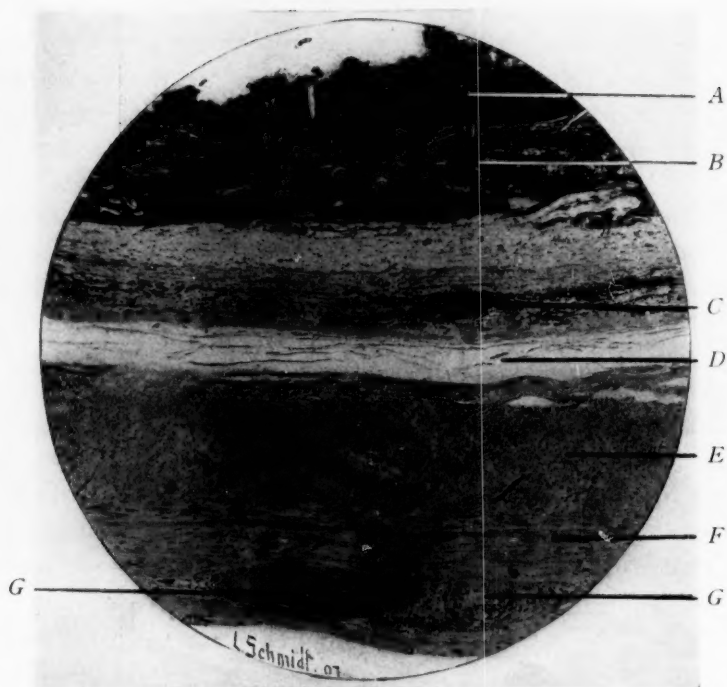
Cystic dilatation of the appendix vermiformis. Outer view. *A*, distal dilated portion of the appendix; *B*, caecum; *C*, proximal portion of appendix; *D*, point of occlusion; *E*, tip of appendix.

FIG. 2.



Cystic dilatation of the appendix vermiformis. Inner view. *A*, distal dilated portion of the appendix; *B*, caecum; *C*, proximal portion of appendix; *D*, point of occlusion; *E*, tip of appendix.

FIG. 3



A transverse section through the wall at the seat of the dilatation. *A*, lime-salts on surface of mucosa; *B*, remains of mucosa; *C*, atrophic lymph follicles; *D*, cedema of mucosa; *E*, circular, and *F*, longitudinal muscular fibres showing fibrosis; *G*, greatly distended artery and vein in serosa. $\times 70$.

the cicatrization producing the obliteration of the lumen. The follicles disappear equally soon, and finally are altogether wanting."

Bischoff thinks that a dilatation is wanting when the mucous membrane is still able to resorb in the normal way. Ribbert maintains that a dilatation is also wanting when as a result of early and extensive destruction of the mucous membrane, no secretion in the lumen occurs.

Latham states that "a number of factors may lead to retention of its secretion in an inflamed appendix. When its muscular coat is inflamed, and its functional activity thus impaired, the expulsive powers of the appendix become insufficient. In other cases external mechanical conditions such as twists, kinks, abnormal position or fixation of the organ give rise to retention. The swelling of the mucosa itself and Gerlach's valve may also prevent the exit of the contents of the appendix. The secretion after it has once begun to accumulate favors further retention in two ways, *i.e.*, in the first place by exerting mechanical pressure on the wall of the appendix; in the second place by serving as a good culture medium for the growth of bacteria."

Obermayer states: "In a minority of the cases the process terminates in a different condition which is known as hydrops of the vermiform appendix (mucocoele). In these cases the lumen is locally obliterated, presumably as a result of ulcers due to catarrhal ulcerative appendicitis (with or without stercoliths), or occasionally by kinking or constriction of the appendix by external factors, chiefly chronic peritoneal adhesions. These internal cicatrices are comparatively common near the caecal orifice, but they may be found in any part of the organ; this also applies to constrictions due to external causes. The cicatricial stenosis is not always complete, and there is sometimes a minute communication between the lumen of the appendix and the caecum when obliteration of the lumen occurs in the appendix; when no virulent bacteria are present, no suppuration occurs. Cystic dilatation of the distal part of the organ does not necessarily follow, and does not occur when

the secretion present in the organ is absorbed or when the mucous membrane is destroyed, and therefore, unable to manufacture any further secretion."

Deaver states that, "Not all cases are due to an obliteration of a portion of the lumen of the appendix. Sufficient obstruction may be produced by an acute angulation. The development of this condition of cystic dilatation of the appendix depends upon several factors. The obstruction of the lumen must be complete, or almost so; the obstruction or obliteration must have obtained at a time when the affected portion of the organ contained no pathogenic micro-organisms; the mucous membrane of the affected portion must be intact, or at least capable of functioning, and the secretion by the mucous membrane must be more rapid than the absorption from the portion of the appendix involved. If the obstruction be not complete, the secretion is likely to be forced through even a narrow opening with sufficient rapidity to prevent a large accumulation, and on the other hand, infection is likely to occur through the patulous lumen, converting a cystic dilatation into an empyemá. If there are already virulent bacteria in the affected portion of the appendix, an empyema, of course, rather than a cystic dilatation, will develop in the first place. If the mucous membrane is incapable of functioning there can be no accumulation of fluid, and the same is also true if absorption be more rapid than secretion."

Kelly and Hurdon state, "If a portion of the canal distal to the obstruction remain patent, the normal secretion, having no outlet, accumulates in it and a retention cyst is produced. The contents of the cyst are, at first, composed of the normal mucous secretion of the appendical mucosa, or of a mucopurulent, sometimes sanguinous fluid; but later, probably owing to pressure atrophy of the mucosa and consequent loss of function, the mucous secretion ceases, and the fluid becomes serous or watery in character. If the occlusion has occurred close to the cæcal attachment of the appendix, the cyst appears to arise directly from the cæcum. If the obstruction is at a more distant point the cyst appears to be pedunculated, being

attached to the cæcum by the normal proximal portion of the appendix."

Gross Pathology.—Cysts of the appendix vary greatly in size. Cases have been reported which have ranged in size from a pea to a large walnut, while exceptional ones have been as large as a pear or even greater,—such as that described by Sonnenberg, which measured 14 cm. in length and 21 cm. in its greatest circumference. Other large cysts have been reported by Virchow and others. Virchow's specimen was the size of a fist. Deaver reports a specimen the size of a small orange. The shape of these cysts also varies. They may be cylindrical, ovoid, or irregular. As a rule where the occlusion is at the junction of the cæcum and appendix, they are symmetrically dilated, usually being sausage- or banana-shaped. When the occlusion is situated some distance from the cæcum, they may be small and round. Occasionally secondary cysts develop in the remains of partly occluded glands. Hernia-like protrusions into the mesentery may occur, as in the cases described by Ribbert, Kelynack, and Kelly and Hurdon. At times the cyst is produced by bands of adhesions at the cæcal end, and when this takes place, and although the cyst is very large before operation, its size may suddenly diminish during exposure on account of the manipulations necessary to bring it into view, thus causing the adhesions to break or the kink to be released. As a result the cyst contents escape into the cæcum, and its walls become flaccid.

The external appearances of the cysts are more or less uniform. As a rule there are few if any adhesions connecting the cyst with surrounding structures. The walls are smooth, firm, thickened and transparent. Dilated enlarged blood-vessels can be seen in their walls. The inner surface is generally smooth, glistening, and attenuated. At times there is a well-marked deposit of lime salts upon its inner surface, and its contents, if organized, may in places be firmly attached to its walls. At times the contents may be clear, watery, serous, and of a whitish or yellow color. When this condition is present the term hydrops of the appendix may be applied.

Generally, however, the contents are of a whitish-yellow, slightly turbid, gelatinous character. The contents may at first be of a tenacious mucoid character and later change to a serous nature. Deaver states that "this ensues because the wall of the appendix, as it becomes distended, usually also becomes thinned, its inner surface growing smooth and the distribution of its vessels being more superficial than normal. This results on the one hand in facilitating the escape of the watery parts of the blood, and on the other, in reducing to a minimum the formation of the mucus."

Microscopic Pathology.—The microscopic appearances of the wall of the cyst generally consist of moderate chronic inflammatory changes associated with pressure atrophy of its walls. The mucosa is generally thinned and may be entirely absent, or in a moderate degree of atrophy, due to the mechanical pressure of the contained fluid. The submucosa may be œdematous. The lymph-follicles are either very much flattened or entirely absent, dependent, of course, upon the size of the cyst and the length of time the process has been progressing. Generally the muscular layers are well preserved, but there is usually a moderate amount of fibrous tissue present. At times the muscular layers are entirely replaced by fibrous tissue. When the process has been moderately slow and there has been a mild grade of inflammation present, the walls may be more thickened than normal. The contents of the cyst are generally sterile.

Résumé of the Cases from the Literature.—A summary of the cases found in the literature and that of the author, in all 68 cases, shows the following facts: 33 cases were observed at the operating table, 18 were found at autopsy, and in 17 the method of observation is not recorded. Of the 33 cases observed at the operating table there were symptoms of appendicitis in 20. In 13 cases the cyst of the appendix was found during the course of operations upon other structures. Of these 13 cases, 4 were present in hernial sacs, and 2 were associated with ovarian cysts. Of the 68 cases, 9 were found in males, 8 in females, and in 51 the sex is not recorded. The

cyst included the entire appendix in 11 cases, it was localized to a portion of the organ in 20, and in 37 no note was made as to whether it was general or local. The contents were described as being mucoïd in 4 cases, gelatinous in 12, colloid in 4, fluid in 7, and in 4 cases there were carcinomatous areas present in the walls of the cysts. Of the 32 cases in which the age is recorded it is given as follows: between 1 and 10 years, one case; between 11 and 20 years, two cases; between 21 and 30 years, seven cases; between 31 and 40 years, eight cases; between 41 and 50 years, seven cases; and between 51 and 60 years, seven cases. While the great majority recorded were not very large, some were notably so, such as the following cases: Wood's and Combemale's were 20 cm. in length; Finkelstein's measured 16 cm. by 14 cm.; Montgomery's measured 5½ in. by 4¾ in.; the author's measured 30 cm. along its greatest longitudinal curvature and 14 cm. in its greatest circumference; Deaver's was the size of an orange; and the one recorded by Virchow was the size of the fist.

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PROSTATIC ABSCESS.

OBSERVATIONS UPON THE PATHOLOGY AND OPERATIVE TREATMENT.*

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THE object of this paper is to record a series of observations upon the pathology and operative treatment of abscess of the prostate caused by gonorrhœal infection. I have not included in this report cases of abscess occurring in the enlarged prostate of elderly men, nor cases of tuberculous abscess of the prostate.

I have taken as a basis of this report all operations performed for prostatic abscess of gonorrhœal origin in my service at Bellevue Hospital during the years 1905-1908, inclusive. All of these patients were treated under similar conditions. The operations were performed in a public clinic and the histories of all the cases are a matter of public record.

These cases of prostatic abscess of gonorrhœal origin were treated either by median perineal section and drainage of the abscess into the urethra, or by median perineal prostatectomy.

The following table shows the number of cases treated by each of these two methods of operation during the years 1905, 1906, 1907, and 1908. The cases treated by each operation are arranged in parallel columns:

TABLE I.

Cases of Prostatic Abscess Occurring During the Course of and as the Result of Gonorrhœal Infection of the Urethra. Treated at Bellevue Hospital in Dr. Alexander's Service.

Year.	Perineal Section and Drainage. No. of Cases.	Prostatectomy. No. of Cases.
1905	12	2
1906	6	13
1907	2	17
1908	6	10
	<hr/> 26	<hr/> 42

* Contribution from the Department of Diseases of the Genito-Urinary System, Cornell University Medical College.

Read before the New York Surgical Society, Jan. 27, 1909.

Total number of cases of prostatic abscess, 68.

This gives as a basis for comparison 26 cases of prostatic abscess treated by perineal section and drainage of the abscess into the urethra, and 42 cases of prostatic abscess treated by median perineal prostatectomy, a total of 68 cases of prostatic abscess.

The ages of the 68 patients subjected to these two methods of operative treatment have been arranged in Table II.

TABLE II.

Ages of Patients.	Perineal Section and Drainage. No. of Cases.	Prostatectomy. No. of Cases.
18-25 years	13	15
25-30 years	6	15
30-35 years	4	8
35-40 years	1	1
40-44 years	2	3
	Total 26	Total 42
Youngest patient,	18 years	20 years
Oldest patient,	44 years	43 years

It will be seen by reference to this table that nearly all of these patients were young men. Twenty-eight cases, or more than one-third the entire number, were between the ages of eighteen years and twenty-five years; and twenty-one were between the ages of twenty-five years and thirty years. Therefore, forty-nine cases, or nearly three-fourths of the entire number, were under thirty years of age.

The prostatic abscesses in these cases occurred during that period of life in which gonorrhœal infection of the urethra is most common.

The time at which prostatic abscess developed in the course of the gonorrhœal infection is shown in Table III.

TABLE III.

	Perineal Section and Drainage. No. of Cases.	Prostatectomy. No. of Cases.
Abscess occurred during first gonorrhœal infection	12	19
Abscess occurred after two or more previous attacks of urethritis which were cured (?)	6	4
Abscess occurred in cases of relapsing urethritis in	8	19

It should be noticed that the prostatic abscess developed during the course of a first urethral infection 31 times, or in nearly one-half the cases; in 10 cases the patients had had two or more infections of the urethra preceding the formation of the prostatic abscess.

In 27 cases there had been relapsing urethral discharge for varying periods, but in some of these cases there was a history of symptoms of previous prostatic suppuration.

Table IV shows the frequency with which prostatic suppuration was associated with perineal abscess and with ischio-rectal abscess.

TABLE IV.

	Perineal Section and Drainage. No. of Cases.	Prostatectomy. No. of Cases.
Prostatic abscess was associated with		
perineal abscess in	8	8
With ischio-rectal abscess in	1	4

It should be noted that perineal abscess, usually arising from a co-existing bulbitis, was present in 16 cases. In 5 cases there were complicating ischio-rectal abscesses of prostatic origin. The number of ischio-rectal infections in this series of cases is below the average, and is due to the fact that in many of the cases of prostatic abscess early operation was performed. I am convinced that nearly, if not all, ischio-rectal abscesses which come under the observation of the genito-urinary surgeon are of prostatic origin, and that the reason so many ischio-rectal abscesses relapse (which they certainly do) after treatment by simple incision and drainage is because the prostatic origin of the infection is overlooked. To cure these ischio-rectal abscesses the source of the infection in the prostate must be removed either by drainage of the abscess, or by prostatectomy.

Table V. shows the proportion of cases in which there was marked urethral stricture.

TABLE V.

	Perineal Section and Drainage. No. of Cases.	Prostatectomy. No. of Cases.
Urethral stricture was present in....	3	6

There were only nine cases of stricture properly so called, but a very large number of the cases showed a congenitally narrow external urethral meatus necessitating meatotomy, and this fact should not be lost sight of as a contributing causative factor in prostatic abscess. I believe that the imperfect drainage of the urethra caused by this defect may play a not unimportant rôle in causing many of the complications incident to gonorrhœa.

Table VI shows the proportion of cases in which the suppuration was confined within the limits of the prostatic capsule, and those in which there was an extension of the suppuration outside the prostatic capsule (periprosthetic abscess).

TABLE VI.

	Perineal Section and Drainage. No. of Cases.	Prostatectomy. No. of Cases.
Pus confined within the prostatic capsule	17	28
Pus had extended outside capsule....	8	14
Abscess had opened into rectum....	1	0

It should be noted that of the 68 cases, in 45 the pus was contained within the capsule, while in 22 cases there was periprosthetic suppuration. In many cases one or more abscesses had ruptured into the urethra either before or at the time of operation, but in all of these cases other foci of suppuration which had not opened into the urethra were found in the prostate at the time of operation. A number of the patients had acute epididymitis at the time of admission, and several of these patients were admitted to the hospital with this diagnosis, the prostatic condition being overlooked.

Table VII shows the frequency with which prostatic abscess was associated with retention of urine.

TABLE VII.

	Perineal Section and Drainage. No. of Cases.	Prostatectomy. No. of Cases.
Abscess caused retention of urine in	14	21

Of the 68 cases of prostatic abscess, 35 cases, or more than 50 per cent., had retention of urine. In the majority of these

cases the retention was complete. In some of the cases the patients were able to void a little urine at frequent intervals, but in all of the 35 cases the bladder was distended.

The retention was usually preceded for several days by frequent and painful attempts to urinate, the retention gradually increasing.

The operative treatment of prostatic abscess by median perineal section and drainage of the abscess into the urethra was described by me, and my reasons for preferring this method of treatment at that time, were given in a paper read before this Society in October, 1904.¹ This method of operative treatment, by median perineal section and drainage of the abscess into the urethra, I have continued to employ in certain selected cases up to the present time, and I am convinced that in many cases it will be the operation of choice.

This operation is especially good in cases of a single focus of suppuration or of a large prostatic abscess where one or both lateral lobes have been practically destroyed by the suppurative process.

This operation is, however, not applicable to cases of multiple abscesses of the prostate; and in this class of cases, which are by far the most numerous, I believe that time can be saved and a more perfect cure can be made by the entire removal of the diseased lateral lobe or lobes by median perineal prostatectomy.

In 1905 I found that in parenchymatous suppuration of the prostate, when detected early, the affected lateral lobe was the seat not of a single abscess, but of multiple abscesses, and that it was usually by the union of several of these isolated foci of suppuration that the typical large prostatic abscess was formed.

I also observed that often when a single small abscess was opened and drained by operation, later another abscess which had been overlooked, or had not fully formed at the time of the first operation, would require operation.

¹ "Prostatic and Periprostatic Abscess," *Annals of Surgery*, December, 1905, p. 883.

These relapses I found could be prevented by the removal of the diseased lateral lobe. I therefore have continued to remove in many cases the portion of a prostate which was the seat of an abscess by median perineal prostatectomy by the same method which I have consistently employed in all cases of enlargement of the prostate since 1896.

The results clinically of this method of treatment of prostatic abscess by prostatectomy have been most satisfactory.²

The removal of these suppurating prostates has furnished material for the study of the evolution and pathology of prostatic suppuration which has not been available before for this purpose. The truth of these clinical deductions has been confirmed by the pathological examinations of the suppurating prostates removed by prostatectomy. The majority of the cases, 42 in number, form a part of the basis of this paper.

These suppurating prostates removed by operation have been examined immediately after removal, and the gross anatomical changes have been noted. The specimens then have been subjected to microscopical examination, either in the pathological department of Cornell University Medical College by Professor James Ewing, or in the Clinical Laboratory by Professor Hastings and Dr. Warren. A number of these prostates are presented with this paper to show the gross anatomical lesions; and photographs illustrating the microscopic anatomical changes have been made by Dr. Jaches, of the Loomis Laboratory. These also are presented. I wish to express my obligation and thanks to these gentlemen for their painstaking work, and for the valuable criticisms which they have made as my work upon this subject has progressed.

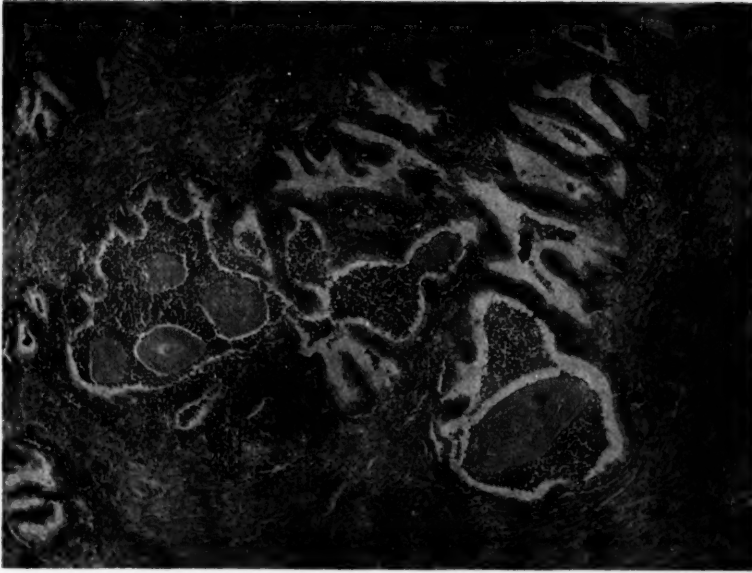
These specimens and microphotographs illustrate very well the progressive changes which characterize suppurative lesions of the prostate caused by gonorrhœal invasion of the gland.

These lesions shown progressively:

1. A purulent catarrhal inflammation with exudate chiefly within the gland tubules.

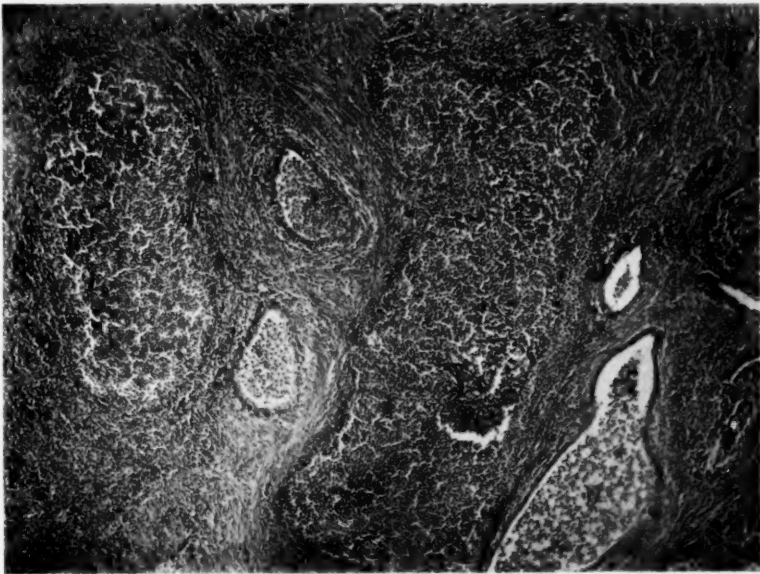
² "Prostatectomy in the Treatment of Prostatic Abscess of Gonorrhœal Origin," Boston Med. and Surg. Journal, November 5, 1908, p. 620.

FIG. 1.



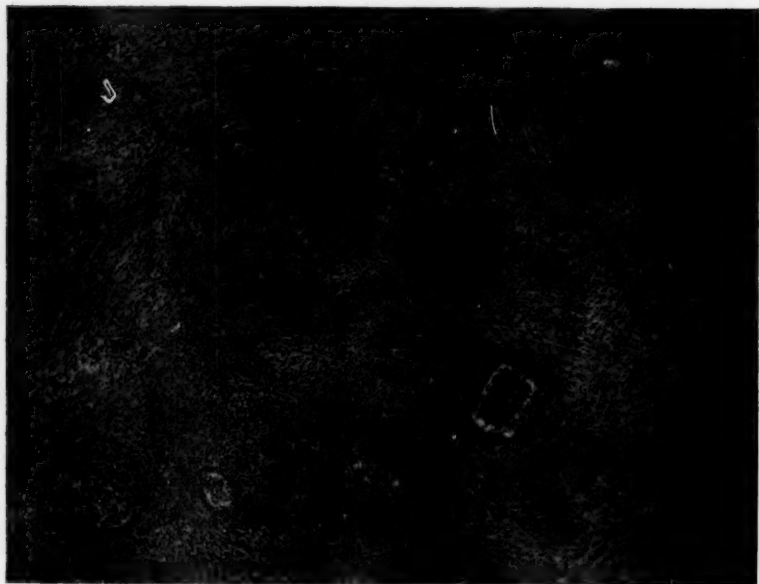
Suppurative catarrhal prostatitis.—The exudate is confined principally to the gland tubules.

FIG. 2.



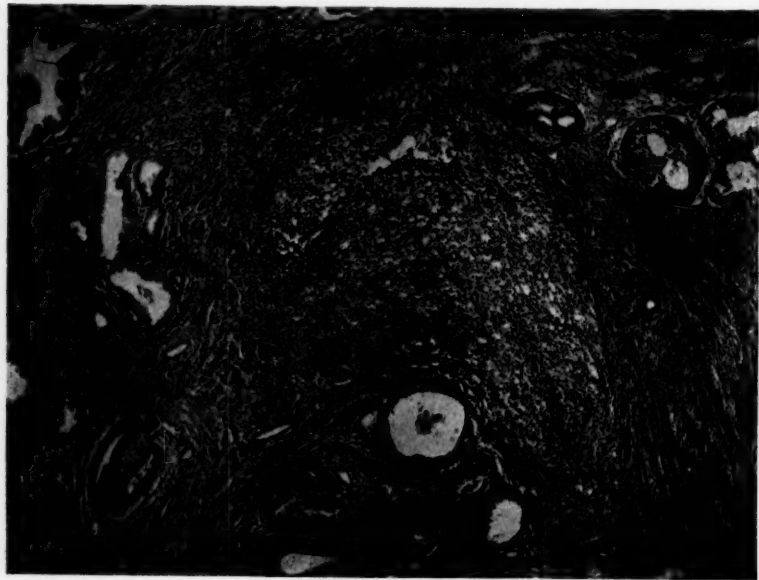
Purulent infiltration and destruction of walls of alveoli.—Miliary prostatic abscesses.

FIG. 3.



Diffuse suppurative prostatitis with destruction of alveoli.

FIG. 4.



Chronic suppurative prostatitis.—Chronic oedema, hypertrophic degeneration and softening, hyperplasia and metaplasia of tube cells.

2. An interstitial purulent process starting from the tubules invading the surrounding stroma, destroying the tubules and stroma, and forming miliary or larger abscesses—the larger abscess being produced by the union of two or more abscesses, caused by necrosis of the intervening tissue.

3. Chronic exudation and productive processes. These are later manifestations of the same process of inflammation. These processes are characterized by infiltration of the stroma of the prostate with mononuclear cells, the appearance of compact foci of lymphocytes, chronic œdema, areas of softening composed of leucocytes, swollen degenerated epithelial cells, and other fixed tissue elements, and occasionally of advanced hypertrophy and metaplasia of the tubule cells.

All of these lesions are often combined in a single case of prostatic abscess, showing in different portions of the prostate all three stages of the process.

The position of the abscesses in the prostate and the relation which they have to the urethra is subject to great variation. The abscesses always occur in the lateral lobes, and especially in that part of the lateral lobes situated at the side of the urethra. One lobe may be affected, but it is not uncommon to find suppurating foci in both the lateral lobes. The extent of the destruction caused by these abscesses is not the same in each lobe. One lobe is usually more affected than the other. An early operation may do much, I think, to preserve at least one-half of the prostate. The abscess may be situated near the urethra, or in the centre of the lobe, or near the capsule.

An abscess of small size near the urethra may rupture spontaneously into this canal, and if the drainage is good the cavity of the abscess may heal. This happy termination is, however, more theoretical than real. Multiple suppurating foci scattered throughout the prostate occur as a rule, and therefore in many cases in which one abscess has ruptured spontaneously into the urethra an operation will be required.

As a result of my observations in this series of cases, and in other cases operated upon in private practice which are not included here, I am convinced that prostatic abscess as a result

of gonorrhœal infection is much more common than is usually supposed. The symptoms in many of these cases were not in accord with those often described as accompanying prostatic suppuration, and in some cases, the existence of abscess might have been overlooked, but for the physical examination.³

As a result of our investigations of prostatic suppurations I offer with confidence this new method of operative treatment of prostatic abscess by perineal prostatectomy. The operation is based on a better understanding of the anatomy and of the pathology of the disease, and I think it will commend itself to those who will carefully employ it clinically. I think that as our knowledge of infectious diseases of the prostate becomes more accurate it will become more and more apparent that these suppurative conditions of the prostate cannot be treated by such methods as are now employed, as, for example, by over-dilatation of the urethra and by massage. I believe that these methods will have their day and that the principles underlying the operations now described will receive the endorsement of those who shall have tested them clinically.

³ For further particulars see article in Boston Med. and Surg. Journal, November 5, 1908, p. 620 *et seq.*

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 13, 1909.

The Vice-President, DR. ELLSWORTH ELIOT, JR., in the Chair.

NEPHRECTOMY FOR MULTIPLE KIDNEY INFARCTS IN A CHILD.

DR. FRANK S. MATHEWS presented a girl, twelve years of age, who was admitted to St. Mary's Hospital on June 25, 1908, after a week's illness characterized by chills, fever, and abdominal pain, with vomiting and moderate constipation. There was some abdominal rigidity and tenderness, more pronounced on the right side. The patient's temperature, on admission, was 102.5° , and the case was regarded at that time as one of acute appendicitis. The child was given an enema, and on the following morning the temperature had dropped to normal and the abdominal tenderness and rigidity had disappeared.

The child was sent to the country, and Dr. Mathews saw her for the first time on her return, on July 17. He was informed that during her absence she had had three elevations of temperature on different occasions to 104° , 105° , and 106° . An examination of the urine showed that it contained a large amount of pus. On palpation of the kidneys under ether they seemed to be of normal size, and a cystoscopic examination of the bladder was also negative. She had no symptoms referable to the kidneys, excepting on one occasion a slight tenderness in the costovertebral angle; this, and the continued pus in the urine and the intermittent elevations of temperature, were practically her only symptoms. On August 5 both ureters were catheterized, and the catheters were left in for one hour. The right kidney drained very well, the urine containing much pus; the catheter in the left ureter practically did not drain at all, thus leaving the condition of that kid-

ney in doubt. The temperature continued to fluctuate, most of the time being normal. The urine still contained large amounts of pus, but no tubercle bacilli were found after a number of examinations.

It was finally decided to cut down on the right kidney, and this was done on August 15. The kidney was apparently of normal size. The perirenal fat was cedematous, and in two spots it was adherent to the surface of the kidney. The upper of these areas was white in appearance, suggesting a good-sized miliary abscess. Lower down on the kidney surface was a reddish-purple area which bled easily on manipulation. The left kidney was exposed through a small incision and was found to be apparently normal. The nephrectomy on the right side was thereupon completed. An examination of the organ after its removal showed a white fibrous infarct at its upper pole. The lesion lower down proved to be an abscess cavity draining into the renal pelvis.

For a few days after the operation the urine still contained a large amount of pus. Within two weeks, however, it became perfectly clear and had since remained so. Convalescence was otherwise uneventful.

DR. CHARLES L. GIBSON said that in dealing with surgical conditions of the kidneys we were sometimes in doubt as to the extent of the lesion, and under those circumstances he thought an exploratory incision of the kidney itself advisable. The kidney, after delivery, could be freely split and examined, and, if the conditions warranted it, it could be sutured and replaced. A limited resection of the kidney, he believed, would be the operation of the future in a number of cases. Personally, he had had two such cases where very marked renal symptoms were relieved after the removal of a small focus. He did not think that anything short of an incision of the kidney could tell us just what the condition of the organ was.

DR. SAMUEL ALEXANDER, referring to cases of infarcts of the kidney, said he had seen two cases this winter in which the infarcts were situated so close to the pelvis that it was anatomically impossible to do a resection without opening into the pelvis. In dealing with a tubercular kidney, he believed that the proper course of procedure was to do a nephrectomy and that anything short of that was unjustifiable, because even a small, isolated tuberculous focus could not be safely left. The speaker said he did

not favor a partial resection of a tuberculous kidney, although he saw no objection to it in dealing with a septic infarct on the surface, where it could be easily removed.

DR. GEORGE WOOLSEY referred to one case of multiple septic infarcts of the lower pole of the kidney in which he did a partial resection of that part of the kidney only.

DR. ALEXANDER said there were undoubtedly cases where a single infarct could be successfully removed by resection, but there were others in which the infarcts were so located as to make a nephrectomy imperative.

DR. HOWARD LILIENTHAL said that in some of these cases of septic infarcts of the kidney all that was necessary was a simple nephrotomy, thus relieving tension. The fact should be borne in mind that these infarcts were very apt to be bilateral, and it was difficult to tell whether or not the opposite kidney was similarly diseased.

DR. CHARLES H. PECK recalled one case of nephrectomy for septic infarct where he afterwards regretted that he had not resorted to a less radical surgical measure. The septic foci in this case consisted of numerous small white spots under the capsule, and it might perhaps have been successfully treated by a simple nephrotomy or decapsulation.

DR. WILLY MEYER mentioned a case of ureteral stone with the subsequent development of miliary abscesses (due to colon bacillus) in the kidney, which was treated by simply splitting and draining the kidney. The patient recovered and had remained well since. In another case he did a nephrectomy after assuring himself that the opposite organ was healthy.

COMPOUND DEPRESSED FRACTURE OF THE SKULL.

DR. PARKER SYMS presented three cases which had occurred in his service at Lebanon Hospital, as being of interest, the first case on account of its extensive injury, and the second and third cases on account of the peculiar character of their wounds.

The men (Cases II and III) attacked each other with hatchets, and one (Case II) had three compound depressed fractures of the skull, and two severe wounds on the neck made by a razor. The other (Case III) had two fissure-fractures of the skull, and two compound depressed fractures, besides which his nose had been nearly cut off.

These cases were treated under Dr. Sym's supervision, by his adjunct, Dr. M. S. Kakels, and to him is due the credit of these excellent results. Dr. Sym called attention to the fact that these cases were treated according to his well-established rule governing the treatment of all injuries to or over the vertex, namely: All scalp wounds are explored for fractures, and all fractures are trephined, whether there be symptoms or not. It so often happens that an apparently insignificant fracture of the outer table is accompanied by extensive damage to the inner table with comminution and depression, and with infected clots. He believes that by this means there is no undue risk to the patient, and many bad results are avoided. In this way only is one sure of avoiding infection and consequent meningitis, and in this way only can one be sure of preventing epilepsy and other consequences of a neglected depression of the skull.

CASE I.—A little boy, aged six years, was brought to the Lebanon Hospital on January 21, 1909, in the ambulance, with the history of having fallen down a flight of stone steps, head first. He was picked up in a semiconscious condition and was still in that condition when brought into the hospital about four o'clock P.M. He did not vomit. The patient was very drowsy when not disturbed, and was not fully conscious. The pupils were equal, moderately dilated, and reacted to light and accommodation. There was a slight internal strabismus of the left eye, this (as later inquiry elicited) was the result of cerebrospinal meningitis that the child had two years ago. His mouth, nose, and ears showed no signs of hemorrhage. On the head were found multiple scalp wounds (four in number), situated in the left parietal and occipital regions; a compound depressed comminuted fracture of the vault near posterior and superior border of the parietal bone; a compound linear fracture over the anterior part of the parietal bone; also a linear fracture from the depressed comminuted fracture passing down to the occipital bone, where a compound stellate fracture was found. At the site of the comminuted fracture lacerated brain tissue presented through the wound as a hernia cerebri, about a teaspoonful being on the dressing. The pulse was irregular, very rapid, of fairly good force and tension. The lungs, heart, abdomen, and extremities were normal.

He was in the operating room about an hour later. Dorsal

position with the head elevated. The scalp wounds were enlarged by making cross incisions, retracting the flaps, and by trephine and rongeur forceps; the depressed spiculæ of bone removed over an area larger than a silver dollar. The protruding and lacerated brain (about a good-sized tablespoonful) was removed, the dura sewed over, and a small opening left for the insertion of an iodoform gauze drain. The other fractures were explored, cleaned, and drained, and the scalp wounds closed with silk-worm gut sutures. In closing the dura there was constant pulsation of the brain, and consequently quite a protrusion, as though it were under pressure, and quite a little difficulty was experienced in closing this membrane, but by inserting a layer of rubber tissue under its edges, the brain was kept back until the sutures were passed, and then removed through a small opening which was left for the insertion of a small drain to the lacerated brain. Over the closed dura, between it and the scalp, a layer of iodoform gauze was placed and extended to the same opening, which was left in the scalp for the drainage of the brain. On January 26, that is, five days after the operation, the scalp wounds were found to have healed by primary union and the gauze between the scalp and the dura was removed. Three days later, on the 29th, the drain to the brain tissue was removed and the small opening allowed to close. At no time was the temperature higher than 100°, which was reached on the day following the operation. The drainage opening into the scalp did not close, and in consequence there was a small hernia of the brain about the size of the tip of the little finger. On February 10 this was cut off, the edges of the scalp wound freshened, the brain depressed, the wound sutured; primary union without any further trouble was obtained. During the child's convalescence he showed absolutely no ill effects of the traumatism to his brain. His special senses were intact; he had no meningeal or cerebral symptoms; and from the time of his operation up to the present day, no impairment of his mental faculties. This must be attributed to the lesion having been in a silent area of the brain.

CASE II.—A man, aged 28 years, was admitted with two razor cuts, each about three inches long, on the left side of the neck, and three scalp wounds, one in the posterior portion of right parietal bone, about one inch long; another through the middle of the sagittal suture; and another over the midanterior

part of the left parietal bone. Under gas and ether anaesthesia the posterior wound was enlarged; the periosteum was found lacerated and a depressed comminuted fracture about one inch in diameter was found. The depressed fragments of the outer table were removed and fragments of the stellate fracture of the inner table lifted from the underlying dura with forceps. The epidural clots were removed and the dura found intact.

The middle wound just above the longitudinal sinus was one and three-quarter inches long; it was enlarged to six inches in a transverse line. The vault was found fractured and depressed for an area of one and three-quarter inches. A small piece of metal wedged into the skull was gradually chiselled from the whole thickness of the skull, and when lifted out it was found to have perforated the dura. This piece of metal was a broken sharp edge of a hatchet, and measured about one-quarter by one-half an inch.

The depressed fragment of the outer table was raised with the periosteum so as to make a flap, and this turned back, but broke off at its attached portion. The inner plate or table was found to be a comminuted depressed fracture; the fragments were removed and dura exposed and found perforated. A gauze drain was inserted to the dural opening; scalp sutured with silk-worm gut; and a rubber tissue drain inserted at outer extremity of wound.

The anterior wound, three-quarters of an inch originally, was enlarged to about two inches in an anteroposterior direction, uniting with the middle wound. The skull was found to be depressed at both the inner and outer table, to an extent of about three-quarters of an inch. The depressions were raised and removed; dura exposed; clots removed; rubber tissue drain inserted; scalp sutured with silk-worm gut.

This patient, as well as the previous one, made an excellent recovery. The wounds all healed by first intention, except at the site of drains, which also closed when rubber tissue and gauze drains were removed. The patient was out of bed and left the hospital at the same time as the other one. At no time did either of these patients show any disturbance of motor or sensory functions; neither did either show any meningeal symptoms, notwithstanding the numerous or multiple depressed fragments pressing on the meninges.

CASE III.—A man, aged 39 years, was admitted to the Leba-

non Hospital on Nov. 24, 1908, at the same time with Case II, with the history of having received various injuries (as will be described) in a fight with a hatchet and razor. They each were struck on the head and face with the hatchet and one was cut besides on the neck with a razor.

Neither of them, as far as could be ascertained, was unconscious after the injuries, nor was either of them unconscious when brought to the hospital. They complained of pains over the wounds, had no vertigo, and did not vomit. In Case III, the nose was completely severed from the face on the left side. The malar bone was broken, but no splinters of bone found. The right side of the nose was intact. He was bleeding profusely from this and other wounds and from a lacerated wound of upper lip on left side. He had five scalp wounds on the head. The right thumb had several wounds; and a small wound on left forearm near wrist was also found. Of the scalp wounds, four extended over the right side, one on the frontal bone, and three on the parietal; the other on the left frontoparietal junction in midline.

Under gas and ether anæsthesia, wound No. 1 in the scalp was enlarged and exposed a compound depressed splintered fracture, situated on the posterior inner portion of the right parietal bone. By chisel and Doyen forceps the depressed fragments of bone were removed and with rongeur forceps the edges smoothed. The fracture was an inch in diameter. The clots were removed from dura. The dura was not perforated; the brain pulsated. A gauze drain was inserted to dura and scalp sutured to the drain exit.

Wound No. 2 was over the middle of the right parietal bone in a straight line with wound No. 1; it was about three-fourths of an inch long. This was enlarged, and a depressed splintered fracture found. The fragments were raised by chiselling and forceps. The dura was intact; epidural clots were removed; the edges of bone rounded and gauze drain inserted. Scalp was sutured to drain exit.

Wound No. 3 was three-fourths of an inch long at outer posterior portion of the parietal bone on right side. The wound was enlarged; the periosteum found intact; it was incised and vault also found intact; scalp sutured.

Wound No. 4 was found extending from the left posterior middle portion of the frontal bone to the inner anterior part of

right parietal bone. The vault was found to have had a fissured fracture which was chiselled out and found to have involved the outer table only. Rubber tissue drain inserted; scalp sutured.

Wound No. 5, on the right posterior portion of frontal bone, was one inch long; it was enlarged and the vault showed a fissured fracture which was also chiselled and found to involve the outer table only. Scalp sutured with insertion of rubber tissue drain.

Patient made a good recovery after operation. Wounds healed by first intention except at sites of drains, which when removed closed very speedily. Patient was out of bed and well after ten days. Was kept in hospital, however, for observation until December 14, when he was discharged.

THE Y-OPERATION OF ROUX FOR PYLORIC STENOSIS, AND THE NARROWING OF THE APERTURES OF TWO GASTRO-ENTEROSTOMIES.

DR. WALTON MARTIN presented a man 40 years old, who was admitted to the Roosevelt Hospital in the service of Dr. Blake on Nov. 12, 1908. He had always been in good health until twelve years ago. At that time he began to have pain in the epigastrium after taking food. The pain was burning in character and lancinating, and came on about ten or fifteen minutes after meals. It was aggravated by taking food, becoming cramp-like, and was relieved by inducing vomiting. The patient's symptoms gradually became more severe. Nine months after the onset of his illness he was admitted to the New York Hospital in the service of Dr. Robert F. Weir. At that time he was poorly nourished. The stomach was found to be enlarged and there was visible peristalsis in the gastric region. Food was found in the stomach after 24 hours' fasting; a diagnosis of pyloric stenosis was made. On December 15, 1898, a posterior gastro-enterostomy was done by Dr. Weir, a Murphy button being used for the anastomosis. At the time of the operation, a tumor was found at the pylorus. The patient made an uneventful recovery; he gained weight and strength; and left the hospital free from pain on January 26, 1899.

After this the patient remained well for three years. Then his old symptoms gradually returned—epigastric pain brought on by eating and relieved by induced vomiting. These symptoms gradually became more severe; he again lost weight and strength; and in May, 1903, he was admitted to Roosevelt Hospital in the service of Dr. Blake. At that time he was emaciated; the stomach

was enlarged; and there was visible peristalsis. A mass could be felt on a level with the navel and two inches to the right of it. The diagnosis of pyloric stenosis with closure of the gastro-enterostomy opening was made. On May 28, 1903, Dr. Blake opened the abdomen in the median line. The stomach was found much dilated, and at the site of the gastro-enterostomy there was an indurated mass, apparently constricting the opening. A second posterior gastro-enterostomy was performed a short distance beyond the first one, a Murphy button again being used for the anastomosis. Several enlarged lymph-nodes were observed along the greater curvature. One, which was removed for examination, showed only signs of chronic inflammation. The patient again made an uninterrupted recovery and left the hospital June 17, 1903.

For five years he remained well and without pain. About four months ago his old symptoms reappeared, and on Nov. 12, 1908, he was again admitted to Dr. Blake's service. The pain, visible peristalsis, and loss of flesh and strength had all returned. It seemed evident that the aperture of the second gastro-enterostomy had closed, and that a further operation was necessary. On November 18, 1908, for a third time, the abdomen was opened. The stomach was dilated, and there was an indurated mass and many adhesions about the pylorus. On lifting up the omentum and transverse colon, the jejunum was found adherent to the colon and the transverse mesocolon for a distance of several inches, the first part of the jejunum running from left to right and parallel to the transverse colon. There was much induration and many adhesions about the sites of the previous gastro-enterostomies. On account of the adhesions, the patency of the pylorus was not determined, nor the condition of the gastro-enterostomy openings. The lymph-nodes along the greater curvature were enlarged. One, which was removed for microscopic examination, showed only the signs of chronic inflammation. With difficulty, enough transverse mesocolon was freed to make it possible to expose the posterior surface of the stomach. The jejunum was divided about 7 cm. beyond the adherent portion, and its mesentery incised as far as the first loop of vessels. The distal end was then implanted into the posterior surface of the stomach, and the proximal end united to the jejunum opposite its mesenteric border as far down as the slit in the jejunal mesentery would permit. In each instance, two rows of sutures were used to

make the union. In other words, the Y-operation of Roux was performed.

The patient made a satisfactory recovery. He left the hospital twenty-one days after admission. Since the operation, his weight had increased from 128 to 154 pounds. In reply to a question, Dr. Martin said he believed the pylorus obstructed, but not entirely closed.

A NEW AND SIMPLE METHOD OF INTESTINAL RESECTION.

DR. HOWARD LILIENTHAL presented a man, 46 years old, who was admitted to Mt. Sinai Hospital on October 1, 1908, complaining of epigastric pain, vomiting, constipation, and the usual symptoms pointing to a serious gastric disturbance. A test-meal showed an absence of lactic acid, a sufficient quantity of free hydrochloric acid, and a total acidity of 59. His symptoms were of about eight years' duration.

Operation.—Upon opening the stomach, a mass of considerable size was found at its pyloric end. While this was not proved to be malignant, it was considered advisable to do a pylorectomy, with a wide resection of the stomach. The duodenal stump was ligated as tightly as possible with heavy silk, and its mucosa crushed. The stump was then cut through and its mucous membrane cauterized with pure carbolic acid. The pylorectomy was then performed in the usual way. The string attached to the duodenal stump was left protruding from the wound, and a cigarette drain was inserted. The string came away nineteen days later, and the patient was discharged from the hospital on November 14, 1908. The convalescence in this case was extremely rapid, and the patient had since been entirely well.

A pathological examination of the pyloric tumor showed that it was an indurated ulcer, with no signs of malignancy.

A second patient was shown by Dr. Lilienthal, a man, 22 years old, who was admitted to the hospital on December 1, 1908. He was extremely pale, somewhat cachectic, and had lost considerable weight. Palpation revealed a hard, slightly movable mass in the right iliac region, somewhat suggestive of a chronic appendicitis, with abscess, although the fact that it had been present nearly a year made that diagnosis doubtful. The possibility of an ileocæcal tuberculosis was also considered.

Upon operation, a mass about the size of an adult fist was found, involving principally the cæcum and the root of the appen-

dix. There were numerous enlarged glands in the mesocolon. Under the supposition that the case was one of ileocaecal tuberculosis, Dr. Lilienthal first tied off the ascending colon with a double ligature of stout twine, and then treated the ileum in the same way. As the ascending colon was quite firmly fixed to the posterior abdominal wall, he anastomosed the ileum with the transverse colon by a simple side-to-side union. The strings attached to the gut were left hanging out of the wound. They came away on the tenth day, and the man was able to leave the hospital twenty days after the operation. His recovery, similar to that of the first case shown, was remarkably easy and rapid, and entirely uneventful.

The growth in this case, upon pathological examination, proved to be a lymphosarcoma, and as a number of enlarged glands had to be left in the abdomen, injections of Coley's fluid had been advised as a prophylactic measure against recurrence. There was still a small opening in the abdomen through which the ligature had come away.

In connection with these two cases, Dr. Lilienthal said, he believed the method he had followed simplified intestinal resection work. The invagination method took more time and there was always danger of the suture line giving way, especially in the large intestine. In cases where there was distention, we knew that no suture could withstand continuous tension. A ligature, however, if tied tightly, would not give way for a sufficiently long time, and there was no danger of immediate leakage. Another advantage was the speed with which the operation could be done. A side-to-side anastomosis was ample, and there was no strain on the ligated ends. The speaker said that in another case the condition of the patient was such that he had to treat the stump of the duodenum in this way, and he had long resorted to it in dealing with the stump of the appendix.

RESECTION OF STOMACH FOR MALIGNANT PYLORIC STRICTURE.

DR. WILLY MEYER presented a man of 60 with a freely movable tumor of the stomach, allowing free resection. In this case, contrary to his usual custom, he did not crush the stump of the duodenum, and then tie and invert it. He treated the cut through the duodenum in the same manner as that through the stomach, viz., a three-row suture—mattress, retaining, and inverting suture

—and, as in a previous case, was much pleased with the procedure. In cases where he was not quite sure that tying after crushing plus inversion was sufficient, he had repeatedly stitched the head of the pancreas over the stump as an additional safeguard.

Dr. Meyer said he had never resorted to the method described by Dr. Lilienthal, although he could appreciate the advantage of it. He did not see why the string should not be cut off short instead of being left to protrude from the wound. In tying off the appendix, it was usual to cut the string off short.

DR. CHARLES L. GIBSON said that in most cases of benign stricture of the pylorus the stenosis was not complete, and the condition should preferably be treated by making a large opening rather than by the use of the Murphy button. The field of greatest usefulness of the latter was in those cases where the pylorus was resected. Here these artificial stomata operated perfectly.

DR. LILIENTHAL said he could do a suture operation as quickly as he could put in a Murphy button. In reply to Dr. Meyer as to why the string was not cut off short instead of being allowed to protrude, the speaker said he intended to cut it off short in the future. Thus far, the operation was in the nature of an experiment, and, in fact, experiments along these lines on dogs were still being carried on, and he was awaiting their final result.

DR. GEORGE WOOLSEY called attention to the possible occurrence of a fecal fistula after the string method described by Dr. Lilienthal, and he thought it would not take much longer to cut off the suture and cover it with a single purse-string suture.

DR. LILIENTHAL said he saw no reason for the occurrence of a fecal fistula after the procedure he had described. He had done it many times in connection with the appendix and had never seen a fecal fistula result. The drainage in these cases was inside the intestine, which largely obviated the possibility of a fistula.

THE RESULT OF CRANIOTOMY FOR FIBROSARCOMA OF THE ACOUSTIC NERVE ONE YEAR AFTER OPERATION.

DR. WILLY MEYER presented a woman, who had already been presented by him last year at the March meeting of the Society (see *ANNALS OF SURGERY*, August, 1908, p. 309). An operation was done on January 29, 1908, for the removal of a fibrosarcoma of the left acoustic nerve. The patient was 27 years old, who had

been referred to him by Dr. George W. Jacoby, the neurologist of the German Hospital. She presented at the time all the symptoms of a tumor in the cerebellopontine angle, with staggering gait and advanced optic neuritis. Both the left facial and left acoustic nerves were involved. The brain was exposed through a large horse-shoe flap, over the occiput. The entire os occipitale was removed, the longitudinal sinus tied and divided, and both cerebellar hemispheres exposed by means of turning down a heart-shaped flap of the dura mater. The tumor was successfully removed. The patient made a rapid recovery, but was kept under observation in the hospital for four months. Her gait and eyesight gradually improved, and after two and a half months she was able to count fingers through the entire length of the ward. She was now able to read and write, and do embroidery and house work, and she could walk in a straight line. There was slight facial paresis and, of course, deafness on the affected side.

Dr. Meyer said he was in favor of attempting the completion of operations of this kind at a single sitting, chiefly for aseptic reasons. Another desideratum was to secure a sufficiently large exposure of the cerebellum in order to reach the tumor with comparative ease, and thus avoid injury to the pons and medulla.

EPITHELIOMA OF BLADDER.

DR. CHARLES L. GIBSON presented a man, 72 years old, who came under his observation in December, 1907, for an epithelioma of the bladder. The patient had long suffered from severe hæmaturia, and at the time was almost exsanguinated. Prior to operation he was cystoscoped by Dr. Samuel Alexander, who confirmed the diagnosis. A suprapubic cystotomy gave perfect access to the growth, which was encircled and removed entirely. A drainage tube was inserted, and the bladder wall inverted around it and sutured by the method which he had recommended some years ago. The original dressing was removed on the third day. The slight leakage stopped within 48 hours after the withdrawal of the tube, and when the patient left for his home, two weeks after the operation, the wound was entirely healed. The bladder now held about ten ounces of clear urine, and thus far there were no evidences of a recurrence of the growth.

DR. SAMUEL ALEXANDER said he thought the views generally held in regard to the advisability of surgical intervention in tumors

of the bladder were too pessimistic. Personally, he believed that when the tumor was at all movable, it was capable of being extirpated by the method employed by Dr. Gibson. The preliminary insertion of the sutures rendered the removal of the growth much easier; the bladder could then be closed absolutely; and there was no danger of hæmorrhage, all that was necessary being the insertion of a small rubber tissue drain at the lower angle of the wound, down to the line of sutures in the bladder wall. Undoubtedly, Dr. Gibson's method of closing the bladder hastened the convalescence of these patients.

PISTOL-SHOT WOUND OF THE LUNG.

DR. ELLSWORTH ELIOT, JR., presented a man, 22 years of age, who at one o'clock in the morning of December 7, 1908, was brought to the Accident Ward of the Presbyterian Hospital by ambulance, having been shot in the left chest with a revolver of unknown calibre. The injury was followed by immediate unconsciousness, which lasted for a short time. When admitted to the hospital he complained of but little pain; he coughed considerably and vomited several times, the sputum or vomitus, or both, containing a little blood. His temperature was 99°; pulse, 116; respirations, 32.

Examination of the chest showed a bullet wound in the seventh intercostal space, to the left of the axillary line. It was surrounded by several inches of subcutaneous emphysema, and upon coughing, air and blood were expelled from it. Percussion over the left chest was tympanitic; over the right chest resonant. The breathing sounds over the left axillary area were very faint; distinct over the right. The impulse of the heart apex was not visible nor palpable, and the heart sounds could not be heard. The left limit of dulness was 5 cm. to the left of the median line, and the right limit was 3 cm. to the right of the sternal margin. There was no murmur. The action of the heart was a little rapid, but of good force. The action of the pulse corresponded to that of the heart, and was of good quality. The abdomen was rigid and flat; no tenderness.

The patient's temperature began to rise soon after admission, and in eight hours reached 101°. He became quiet and slept well. His cough almost ceased, and he said he felt comfortable and had no pain. Pulse, 92; respirations, 24. The temperature steadily rose until the morning of the third day, when it reached 102.4°.

From that time on it steadily fell, reaching normal on the thirteenth day. During this interval, the pulse had ranged between 64 and 80. The respirations had not been above 24 since the second day.

The patient was given a liberal diet from the start, the only reduction being during the first three days. The local treatment consisted of cleansing the wound, applying a dry dressing, and an ice bag for the first six days to the left chest. The subcutaneous emphysema disappeared on the third day. On the morning of the fourth day the patient began to cough a little; he complained of some pain in the left chest and coughed up a number of blood clots, very dark in color. This expectoration of blood clots continued until Dec. 15, the eighth day after the receipt of the injury. On the tenth day the patient was allowed to sit up in a chair. On Dec. 19, twelve days after the shooting, there was some pain in the left chest upon deep respiration. The anterior lower left chest gave tympanitic resonance, and the breathing sounds in that region were almost absent. In the left axilla, at the level of the sixth rib, there was bronchial breathing; fremitus and tactile sense were much decreased. Posteriorly, from the angle of the scapula to the base of the left axillary region, there was dulness on percussion and vocal fremitus and tactile sense were decreased. An attempt was made to tap the chest, but the patient resisted so much that it was not carried out. The wound closed by a firm scab on Dec. 18, 1908. An X-ray picture showed the bullet in the chest. It was located about three inches below the wound of entry, close to the inner side of the ribs.

A noteworthy feature of this case was that general abdominal rigidity was observed for twenty-four hours after admission to the hospital, without damage to any abdominal viscera.

Dr. Eliot presented, also, a man, 24 years old, who was admitted to the Presbyterian Hospital on Nov. 24, 1908. At 6.30 A.M. he had been shot in the right chest by a .38 calibre revolver, and had been brought to the hospital at once by ambulance. On admission, his temperature was 98.8°; pulse, 80; respirations, 24. There was no apparent shock; no cough. The pulse was of good quality. There was a bullet wound three-quarters of an inch to the right of the sternum, in the lower part of the second interspace. This was bleeding freely. Air crepitus was obtained in the posterior axillary fold. The percussion note over the affected lung was normal; the breathing sounds were distinct; there were

a few moist râles at the base. The bullet could be felt under the skin in the posterior axillary fold.

Five hours after admission the patient's temperature was 98.4° ; pulse, 120; respirations, 28. Œdema of the lungs had developed two hours previously, and there were dulness and diminished breathing sounds over the lower right lung. The chest was cupped, and morphine and stimulants were administered. At 8 P.M. the temperature had risen to 103° , the pulse was 104, and the respirations 36. The patient was somewhat irrational and coughed at intervals. There was a slight pinkish expectoration. The cough continued, and on the third day there was considerable bloody expectoration. During this time the physical signs remained practically unchanged. For a week following the injury the patient's temperature ranged between 99° and 101° ; pulse, between 80 and 100; respirations, between 20 and 32. His mental condition gradually cleared up. He coughed frequently, with purulent sputum, but there was no blood after the third day. He still complained of pain in the chest, especially on coughing. On December 8 the bullet was removed under cocaine. On December 11 the patient's temperature had been normal for a week. He still coughed, but the expectoration was less free. The physical signs gradually cleared up, with the exception of dulness and bronchial breathing over the left base. On December 15 the patient left the hospital, practically well.

DR. GIBSON said that in one case of gun-shot wound of the lung where the patient seemed to be suffocating from progressive loss of blood, the hemorrhage ceased after an injection of diphtheria antitoxin, and the patient finally made a recovery. The speaker said he had used the antidiphtheritic serum in several other cases of obscure bleeding, with beneficial effects, and he recommended the use of this or other fresh serum in cases where we were otherwise powerless to check the hemorrhage, on the theory that the serum favored coagulation. Diphtheria antitoxin made from horse serum can be easily procured, while serum from other animals, such as the hare, may take too long to obtain.

DR. MEYER spoke of the comparative ease with which the lungs could be exposed and manipulated with the help of differential pressure. If conditions warranted, a thoracotomy could be done and the wound in the lung closed by suture. This operation had been performed abroad successfully in a number of cases.

Of course, such procedure must be indicated by the seriousness of the symptoms, as hæmothorax, increasing collapse, etc.

DR. ELIOT said that a number of accidents had been reported abroad during attempted suture of the wounded lung in compressed air cabinets after pistol-shot injuries.

DR. MARTIN said it seemed to him that gun-shot wounds of the lung were unfavorable cases for operation, even under such conditions as Dr. Meyer suggested. By closure of the wounds of entrance and exit in the lung the hemorrhage along the bullet tract would not be stopped. The escape of the blood into the pleura would, to be sure, be prevented, but he thought this might aggravate the condition rather than relieve it.

DR. LILIENTHAL called attention to the value of inhalations of amyl nitrite for the purpose of arresting pulmonary hemorrhages in tuberculosis, and he thought it would be equally efficacious in dealing with a hemorrhage of the lung of traumatic origin.

Discussing the value of sequestration anæmia, Dr. Lilienthal said that about three weeks ago he did a preliminary decompression operation in a case of cerebellar tumor. The sequestration anæmia method was resorted to, and at the beginning of the operation the blood-pressure was 120. After opening the skull, it fell to 90. Then the ligatures that confined the blood to the extremities were loosened, and the blood-pressure immediately rose to 110. A few days later, the second stage of the operation was undertaken. In the meantime, a new house staff had gone on duty. The blood-pressure, at the beginning of this second operation, was 130. The hemorrhage was fast and furious; the blood-pressure fell rapidly, and the patient was in very bad condition, and upon inspecting the sequestration bandages it was found that the extremities had been bandaged from the toes to the body instead of around the proximal part of the thighs. This had produced just the opposite effect to sequestration anæmia.

Dr. Lilienthal said he was in favor of resorting to this additional safeguard in certain operations.

BORDER-LINE TUMORS OF THE BREAST.

DR. CHARLES L. GIBSON read a paper, with this title, for which see page 478.

DR. JOHN A. HARTWELL said he thought surgeons were inclined to be too conservative rather than too radical in dealing with

tumors of the breast. He asked Dr. Gibson what dependence he placed on the pathological diagnosis made by an examination of frozen sections while the patient was on the table. Dr. James Ewing had informed him that he did not look upon that method as of sufficient accuracy to be of value in many border-line cases.

DR. LILIENTHAL said he thought that most surgeons were in accord with the views expressed by Dr. Gibson. A few years ago, the speaker said, Dr. Robert Abbé read a paper in which he maintained that many cysts of the breast could be cured by simple aspiration. Shortly after that, a woman called on Dr. Lilienthal with a tumor in one breast, and she gave a history of having had a cyst in the opposite breast. He advised her to have the tumor removed and examined, but she refused and went to another surgeon, who treated her by aspiration. Soon afterwards another woman came to him with a cyst of the breast which he aspirated. Two years later the same patient returned with the same breast affected by a growth which he was afraid was not cystic, and with enlarged glands in the axilla.

In regard to the value of an examination of frozen sections, to which Dr. Hartwell had referred, Dr. Lilienthal said that if the pathologist pronounced the growth doubtful, then he would do a radical operation, but if he positively pronounced it innocent, then he would remove the tumor only. The patient should be told by the surgeon beforehand that he would do what he thought was necessary, *i.e.*, either a conservative or radical operation.

DR. WILLY MEYER said that many surgeons were inclined to treat these cases of so-called benign tumors of the breast rather expectantly. The operation that had been proposed by T. Gailard Thomas, of New York, in 1882, and lately worked out by Warren, of Boston, namely, extirpation of the tumor, with an almost invisible resulting scar and with preservation of the shape of the breast, was highly recommendable. Under those conditions, many patients would submit to the operation who would otherwise refuse on account of the disfigurement. These tumors were accessible from below, and the normal contour of the breast was thus preserved.

In regard to the value of immediate examination of frozen sections, Dr. Meyer said that in one case where many specimens were examined, only two or three showed distinct evidences of carcinoma, while the rest showed adenofibroma. This seemed to show that it was hardly safe to rely upon the results of such rapid

examinations. In cases that were at all doubtful, the radical operation was indicated.

DR. ELIOT said he agreed with Dr. Gibson that every well-defined tumor of the breast, irrespective of the patient's age, ought to come out. Frequently these operations could be done under local anæsthesia. In many cases, especially in young girls, the presence of a tumor of the breast, even if certainly benign, gave rise to serious worry.

DR. GIBSON, in closing, said he was induced to write this paper by hearing one on the same subject from a member of this Society, in which the line of treatment outlined was totally different from that laid down in this paper. In this connection, Dr. Gibson said, he wished to quote a suggestion made by Prof. Kocher at the First International Surgical Congress, when he suggested Cancer as the subject for discussion at the subsequent meeting of the Congress:

"(1) That in the majority of cases local precancerous predispositions exist, whose cure prevents the development of cancer. (2) That cancer is originally an absolutely local disease. (3) That in the present state of medical science there exists only a single curative measure, the operative destruction of this local focus. (4) That implication of the lymphatics no longer militates against a cure by operation along the lines of the present day practice. (5) That an early operation can be performed by a competent surgeon *without danger to life, without pain, and without a notable disturbance of function.* (6) That the surgeon can promise a definite cure in the majority of the cases presenting themselves for treatment on the appearance of the first symptoms."

A RAZOR FOR SKIN-GRAFTING.

DR. ROBERT H. M. DAWBARN showed an instrument consisting of two safety-razor blades held together by a pair of dressing forceps.

HERNIA OF THE UMBILICAL CORD.

DR. THEODORE DUNHAM reported the case of a child sixteen months old upon which he operated for an umbilical hernia. With the exception of a fecal fistula, which closed at the end of about a week, the child made an uneventful recovery, and left the hospital at the end of six weeks. Since then the child had gained normally in weight and had a perfectly strong belly wall.

Stated Meeting, January 27, 1909.

The President, DR. JOSEPH A. BLAKE, in the Chair.

HYSTERECTOMY AND URETERAL INJURY.

DR. JOHN ROGERS presented a woman, 44 years old, whose chief complaint, when she came under observation, was retention of urine. On physical examination there was felt what appeared to be a large fibroid tumor; it was firmly fixed in the pelvis and could not be moved from below. On August 18, 1908, when the abdomen was opened through a median incision, this diagnosis was confirmed. The tumor could not be lifted out, and investigation showed that the round ligament passed over the top of the fibroid and disappeared behind it, and it was finally found that the growth sprang from the anterior wall of the uterus, low down, and in its growth had pushed the fundus back into the hollow of the pelvis. The vessels were very large and had to be ligated and divided separately. Then, by making a transverse incision over the top of the tumor, it was possible to insert the hand underneath it and deliver it.

Upon concluding this portion of the operation, it was found that the right ureter had been caught in a ligature, and in removing the latter and trying to replace the ureter, about four inches of ureter was denuded of tissue.

Subsequent to the operation, the patient vomited a good deal, the stomach disturbance being regarded as an evidence of an ether toxæmia. On the fifth day the abdominal wound burst open, and the viscera were expelled upon the bed. They were washed and replaced and the wound was again sutured. Under stomach lavage the vomiting gradually subsided. About two weeks after the operation the nurse reported that there was some difficulty in urinating, and upon introducing a catheter into the bladder, very little urine was withdrawn. Three days later, complete retention was reported, and the patient's abdomen was much distended with a large fluctuating tumor. She was again taken to the operating room, the abdomen was re-opened, and about two gallons of urine evacuated. The fluid was apparently extra-peritoneal, and catheterization of the ureters showed that the right ureter was obstructed about one inch above the bladder. The

ureter was normal, therefore the fistula must have been ureteral. A drain was inserted, and the patient made a slow recovery.

In connection with the injury to the ureter in this case, Dr. Rogers said it was not of infrequent occurrence. In one of the foreign clinics, in 400 hysterectomies for carcinoma, there were 24 instances of ureteral fistula following extensive exposure and denudation of the ureters, and in all but two of these, spontaneous recovery took place. In those two cases a pyonephrosis followed, which was successfully treated by a nephrectomy.

COMPOUND FRACTURE OF RADIUS AND ULNA.

DR. CHARLES L. GIBSON presented a young man who in August, 1901, fell out of an apple tree and received a compound fracture of both bones of the left forearm, the protruding fragments perforating the skin and embedding themselves in the ground.

When Dr. Gibson saw the patient, the same night, his temperature was 102°. The wounds through which the bones had protruded were enlarged, the parts thoroughly cleansed, and the ends of the bone refreshed. Within 24 hours the boy's temperature rose to 105°, and evidences of a gas-bacillus infection developed, the arm becoming cedematous as far up as the axilla. A consultation was held, and disarticulation at the shoulder was recommended as first choice, but it was finally decided to make an attempt to save the arm by very free incisions and drainage. This was done, and from that time on the temperature gradually subsided. Altogether, the patient was in bed for two months. During that time there was extensive sloughing of the tissues of the arm, including the bones, necessitating many minor operations. The boy was placed under a general anæsthetic thirteen times. He finally recovered and now has a relatively fair use of the arm. He has complete flexion and extension at the elbow joint, while pronation and supination are limited. He also has fair use of the hand, but cannot flex the thumb at the first joint.

DR. L. W. HOTCHKISS said he had seen a number of cases of gas-bacillus infection, and in only one or two instances of the acute infections had he seen recovery take place without amputation. In fact, in the case shown by Dr. Gibson, amputation, at the time, seemed the proper thing to do. The incisions made into the arm were very extensive, and besides a great deal of

peroxide of hydrogen that was used, a very strong solution of formalin was also applied accidentally, and perhaps that had something to do with discouraging the bacilli.

PERFORATION OF BLIND END OF THE GUT AFTER
LATERAL ANASTOMOSIS.

DR. WILLIAM A. DOWNES presented a man, 33 years old, who came to the New York Hospital service of Dr. Johnson, on August 30, 1908, with a strangulated hernia about the size of an orange, for which Dr. Downes operated on the same night under cocaine anæsthesia. The strangulation had existed for three days, and the condition of the intestine at the time of operating was doubtful, and for this reason was left *in situ*. Two days later, the involved segment of gut, about four inches in length, sloughed out, leaving an opening in the jejunum. At the end of ten days the intestinal fistula was closed by lateral anastomosis. On account of the œdematous condition of the gut and a large amount of fat in the mesentery this form of closure seemed to be most suited to the case.

The patient left the hospital on September 19, and for two months remained perfectly well, with the exception of obstinate constipation. On November 25, after eating a hearty meal, he was seized with cramp-like pains; these persisted during the night and the following day; and 24 hours later, when he was again admitted to the hospital, he had a temperature of 103° ; pulse, 120; abdomen distended and rigid. The symptoms indicated an intestinal perforation, and through a median abdominal incision it was found that the blind end of the proximal limb, which had been left quite long, had perforated, and through this perforation gas and intestinal contents were freely escaping. A clamp was applied, the blind end cut off close to the anastomosis, and the end of the stump was then invaginated and sutured. The patient had a slow convalescence, but eventually made a complete recovery.

DR. JOS. A. BLAKE said he had met with a similar accident, and he thought that the longer the distal end of the proximal segment of the gut, the greater the danger of a subsequent perforation. After a lateral anastomosis, the blind end should be left as short as possible. Otherwise, as some of his experimental work on dogs had shown, the end gradually became dilated, and if sufficiently long it would eventually perforate. Its lumen be-

came dilated and club-shaped, and this brought up the fact that a lateral anastomosis was a faulty operation, because in such a union the intestinal contents were forced into the excluded segment of the gut. An end-to-end or end-to-side anastomosis was preferable.

PROSTATIC ABSCESS; OBSERVATIONS UPON THE
PATHOLOGY AND OPERATIVE TREATMENT.

DR. SAMUEL ALEXANDER read a paper with the above title, for which see page 533.

DR. GIBSON said he had had no experience in dealing with cases of prostatic abscess by prostatectomy, nor could he recall any in which the indications for that operation seemed to exist. He had treated a goodly number of these cases in which the abscess was confined to a single lobe of the prostate by an extra-urethral incision, guarding the urethra by means of a sound, and the results had been very satisfactory.

In connection with the cases cited by Dr. Alexander, the speaker recalled the case of a young man who three years ago, after acute gonorrhœa, developed an abscess of one lobe of the prostate. This was evacuated, and the wound healed promptly. Two and a half years later the man returned with a prostatic tumor the size of a child's head at full term. This proved to be a carcinoma, from which the man subsequently died, the prostate attaining an enormous size.

DR. WOOLSEY referred to the fact brought out in Dr. Alexander's paper that many ischiorectal abscesses, especially those of the relapsing type, depended upon prostatic infection and suppuration and could only be permanently cured by curing the prostatic condition. This he had verified in many such cases which had come under his care at Bellevue Hospital.

DR. ROGERS said he thought Dr. Alexander had not laid sufficient stress upon the connection between prostatic and ischiorectal abscesses; personally, he believed that prostatic infection was a far more frequent cause of ischiorectal abscess than was generally understood.

DR. BLAKE said he supposed the cases of prostatic abscess in which enucleation was indicated were those in which there was more or less persistent inflammation starting in the acini of the gland, and producing permanent swelling. The usual form of

prostatic abscess could be successfully drained in almost any way. In those abscesses located centrally, and attended with considerable destruction of the gland, a prostatectomy might be indicated; but the fact should not be lost sight of that in young men the removal of the prostate must interfere to a certain extent with the sexual function. It would be interesting to determine in what percentage of cases this interference with procreation occurred, and also how frequently there were relapses after simple drainage.

DR. ALEXANDER, in closing the discussion, said that the line of cleavage in the prostate was always clear. As to whether a prostatectomy was necessary or not in a case of abscess, that could not always be determined before the urethra was opened. If exploration of the urethra by the finger showed a single abscess cavity, this should be drained; it was not necessary to remove the prostate; but when multiple abscesses were present a prostatectomy should be performed. The relation between acute infection of the prostate and enlargement of the prostate in later life had not been demonstrated.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, January 4, 1909.

The President, DR. WILLIAM J. TAYLOR, in the Chair.

CONGENITAL UMBILICAL HERNIA.

DR. FRANCIS T. STEWART reported the history of a male infant, born at $7\frac{1}{2}$ months of gestation. The umbilical ring was about 2 inches in diameter, and the cord maintained this calibre for a distance of about 4 inches, when it began to taper to the point where it had been ligated. The cord was filled with a thick, glistening, gelatinous fluid, except at its base, where a sac, continuous with the peritoneum and about 2 inches long, was found separating the vessels of the cord, the arteries lying below and the vein above. A collar of abdominal skin extended up on the cord for perhaps one-fourth inch. Several coils of small intestine could be seen distending the sac through the transparent tissues of the cord, which were as thin as paper. There were no other abnormalities except a small postanal dimple. Several hours after birth the child ceased breathing, became cyanotic, and was restored only after the administration of oxygen and artificial respiration. Operation was undertaken nine hours after birth, without an anæsthetic. The sac was resected, the recti muscles approximated with catgut, and the skin sutured with silk-worm gut. The umbilical arteries felt as firm as the vas deferens and did not bleed when severed, although they could be felt pulsating within the abdomen a short distance below the umbilicus. The skin about the umbilicus was bloodless and resembled white leather. The child was in good condition at the end of the operation but about three hours later developed another attack of apnœa which proved fatal.

Dr. Stewart remarked that congenital umbilical hernia was rare. Adler found one in 5887 new-born infants, and Lindfors one in 5184. Coley says 4 cases were seen among the 75,000 cases of hernia treated at the Hospital for Ruptured and Crippled in New York. Of 37 cases assembled by Lindfors 22 were boys and 15 girls, of the 69 in Buschan's collection 43 were boys and 26 girls.

These herniæ are divided into the embryonic and the fetal, the former developing as the result of arrested development of the abdominal wall, the latter after the umbilicus is closed and lined with peritoneum.

The *embryonic variety*, strictly speaking, is a congenital malformation and not a hernia, because, since its contents have never resided within the abdomen, they cannot have herniated. The blastodermic layers of the embryo arrange themselves in two layers, the somatopleure (ectoderm fused with the external lamella of the mesoderm) and the splanchnopleure (endoderm fused with internal lamella of the mesoderm). These layers curl in from the side so as to form two closed tubes, one within the other, the outer or somatopleure becoming the thoracic and abdominal walls, and the inner or splanchnopleure the primitive digestive tube. The vitelline sac, which is continuous with the primitive intestine, thus becomes constricted at its embryonic attachment, forming the vitelline or omphalomesenteric duct, the intestinal opening of which has been called the intestinal umbilicus. Occasionally this duct persists in after life and is then called Meckel's diverticulum. Between the periphery of the intestinal umbilicus and that of the cutaneous umbilicus is an annular space, large above where it corresponds to the cardiac fossa, and smaller below where it gives passage to the allantois. The primitive abdominal wall (*membrana reuniens inferior* of Rathke) is an exceedingly thin membrane, which progressively advances over the viscera until, at the beginning of fetal life (end of third month), the cutaneous umbilicus is represented by a small circular space through which passed the umbilical vessels, the allantoic and the vitelline pedicles having vanished. When this process is arrested before its completion an embryonic hernia exists.

The coverings of this hernia consist of two avascular layers separated by a greater or lesser quantity of Wharton's jelly. The external layer, corresponding to the amnion, merges with the

collar of skin at the base of the tumor; the internal is continuous with the peritoneum, some believing it to be peritoneum, and others, because of its avascularity, a vestige of the *membrana reuniens inferior*.

The size of the defect varies greatly. An early arrest of development may leave a gap extending from the manubrium to the symphysis pubis. In these cases the heart may be found outside the thorax, but the lungs are retained in position by their pedicles. The pancreas is the only abdominal organ which has not been found in the hernial sac. Such extensive defects are rare, but not infrequently the opening extends from the umbilicus to a point somewhat above the middle of the upper half of the *linea alba*, giving passage to the liver, with or without a portion of the intestine, the umbilical cord lying below, either in the middle line or more often to the left. In living infants the tumor is generally much smaller, seldom exceeding a mandarin orange in size, and either separating the vessels of the cord or pushing them to the left. Ordinarily one or two coils of small intestine are in the sac and occasionally a portion of the liver or the *cæcum*. The presence of the last-mentioned structure is explained by its contracting adhesions with the hernial envelopes before it descends to its final position, or by persistence of the *omphalomesenteric duct*, which arises from the ileum near the *cæcum*. The *omphalomesenteric duct* itself may therefore be found in the hernia, either as a blind pouch springing from the ileum, or as a canal which opens externally at the summit of the tumor, thus forming an abnormal anus. In the latter instance the normal anus may be absent and the large intestine undeveloped. Usually, however, the presence of an *omphalomesenteric duct* reveals itself by a minute fistula, arising spontaneously or as the result of ligation of the cord. If the intestinal end closes there is an umbilical fistula or, consequent upon hypertrophy of the everted mucous membrane, an *umbilicus polypus* or adenoma. If both ends close the tube may distend with mucus and form an umbilical or vitelline cyst. When the *allantoic duct* persists it may appear on the surface of the hernial sac, after ligation of the cord, as a *pseudopenis* discharging urine. Like the vitelline duct it may close at one or both ends and give rise to similar fistulæ, polyps, and cysts. The persistence of these vestiges in the cord have led some to think that they cause the hernia by preventing closure of

the umbilicus. Among other deformities which may be present are epispadias, exstrophy of the bladder, imperforate urethra, imperforate anus, atresia of the large intestine, spina bifida, sacrococcygeal tumor, branchial cyst, etc.

The *fetal variety* of congenital umbilical hernia develops after the third month of intra-uterine existence when the umbilicus is lined with peritoneum. It is therefore covered with peritoneum and is a true hernia. When developing in the early part of fetal life it occupies the centre of the cord and separates the vessels. At a later period the vessels are fixed at the inferior segment of the umbilical ring and are pushed below and to the left by the hernia, which thus corresponds to the usual situation of umbilical protrusions in infants and adults. These herniæ are rarely of large size and usually contain nothing but small intestine. Of the numerous theories given for their origin none is satisfactory; those who are interested in this portion of the subject will find the matter fully discussed by Cumston (*Med. Rec.*, Sept. 3, 1905).

Symptoms.—Children with enormous abdominal fissures are usually born dead before term, the hernial coverings frequently tearing during labor, or yielding even before this time so that the viscera float free in the amniotic fluid. Large herniæ are frequently irreducible, owing to adhesions between the viscera and the sac or to lack of room within the abdominal cavity.

The smaller herniæ are more common and are as a rule easily recognized. The coverings of the tumor are ordinarily so thin and transparent that the viscera can be seen, and the usual features of a hernia are present. When the protrusion is very small, however, it may be overlooked by the obstetrician and be ligated with the cord, particularly if there are adhesions detaining the contents within the sac. A urinary omphalocele is fluctuating, transparent, dull on percussion, and often associated with imperforate urethra.

The *prognosis*, aside from the complications mentioned above, depends largely upon the size of the hernia and the duration of gestation. In infants who survive birth large herniæ usually rupture within the first few days, as the result of ulceration or sloughing of the sac, which has been deprived of its means of nutrition, peritonitis and death following. Spontaneous recovery, however, is possible, the sac becoming covered with granulations and these with epidermis, the abdominal muscles gradually closing in at a later period.

The *treatment* is operation, as early as possible, in all cases excepting the enormous defects incompatible with existence, and the very small reducible herniæ in which a firm, vascular peritoneal sac is present. The latter should be protected from injury and infection, and reduction maintained with a suitable bandage.

Anæsthesia is not necessary and perhaps is better omitted. The best operation is excision of the sac with the collar of skin at its base and closure of the defect with through-and-through silk-worm gut sutures, through-and-through sutures to save time, silk-worm gut to resist the sudden and frequent augmentations in the intra-abdominal pressure as the result of crying. The subcutaneous ligature is blind and dangerous. The extraperitoneal method of Olshausen, in which the sac is reduced without being opened, may be followed by gangrene of this structure. In any method in which the sac is not opened one may fail to discover complications, *e.g.*, a persistent omphalomesenteric duct.

The recent statistics of Ritterhaus (*Deutsche Zeit. für Chir.*, 1907, Bd. 89, p. 257), comprising 94 laparotomies up to 1907, show 65 recoveries and 29 deaths, a mortality of 31 per cent. According to Adler laparotomy within the first 24 hours gives a recovery rate of 88 per cent., after 48 hours, 33 per cent.; of the 72 cases which he collects 27 per cent. died. Jaboulay and Patel (*Nouveau Traité de Chir.*, 1908, T. 25), to whom we are indebted for many of the facts cited above, state, after Aribat, that the mortality of expectant treatment is 50 per cent.

PROPERITONEAL HERNIA.

DR. STEWART reported the history of a man, aged 46 years, who was admitted to the Pennsylvania Hospital, November 28, 1908, in the service of Dr. Gibbon. The patient had been suffering with acute intestinal obstruction for three days. He had been wearing a truss for a left-sided inguinal hernia since childhood, but the hernia had not been down for many years. He had never noticed a hernia on the right side. Both inguinal canals were empty, although on coughing an impulse could be obtained in each. The testicles were normal in form and position. The abdomen was not rigid and only slightly distended, but no tumor could be felt externally or by rectal examination. Peristalsis was active but unproductive, the vomitus black but not fecal in odor. The pain and tenderness were generalized and perhaps

most marked in the left iliac fossa. The condition was thought to be a volvulus or a strangulated internal hernia. After making a median abdominal incision below the umbilicus it was discovered that a loop of ileum had entered a sac of peritoneum lying immediately behind the internal inguinal ring of the right side. The neck of the sac, which was dense and resistant, was nicked with scissors and the bowel extracted. The furrow of constriction had passed exactly across the mesenteric border of the affected loop, hence almost determining a Richter's hernia. The bowel was not gangrenous. The sac was about two inches in diameter and passed neither outwards nor inwards. No communication with the scrotal sac could be found. A similar sac, empty however, was discovered behind the left internal ring. After suturing the orifice with catgut the abdomen was closed, the patient making a smooth recovery.

The rarity of properitoneal hernia is shown by the statistics of Breiter (*Beiträge zur klin. Chir.*, Bd. 13, 1895), who has been able to add only 45 cases to the 24 collected by Krönlein in 1880; about a dozen additional cases might be added to this list. Of these 69 cases 59 were inguinal and 10 femoral.

Of the *inguinal variety* 33 were right-sided, 20 left-sided, and 6 undetermined. Fifty-eight occurred in males, and 23 of these had maldescended testicles. The youngest patient was 18, the oldest 74, and the majority were between the twentieth and fortieth year. An external hernia was present in all but two cases; in one of these the tip of the little finger just entered the internal ring, from within outwards, and in the second there was a small hydrocele. In his own case an external sac could not be found on either side, although one had surely existed on the left side. The average duration of the external hernia was 19 years. Of the 58 males the hernia was congenital in 36, acquired in 10, and undetermined in 12. With a single exception all were incarcerated, and in only two of these was the hernia reduced before operation. In 22 of the 36 inguinal cases collected by Breiter a sausage-shaped tumor could be felt above Poupart's ligament, running outwards towards the anterior superior spine of the ilium (*intra-iliac variety*). If the sac passes into the small pelvis (*obturator variety*) it might be felt by rectum; an antevesical sac could possibly be palpated through the abdominal wall. In three instances the hernia was partial (*Richter's hernia*).

With a bilocular hernia strangulation may occur at the common opening of the two sacs into the abdominal cavity or at the orifice of either sac. The first of these is the more frequent, thus explaining the large number of deaths even after herniotomy, the operator often failing to discover the inner constriction and simply reducing the contents of the outer into the inner sac. This phenomenon may be determined by observing an increase in the size of the iliac tumor, if present, when the outer sac is emptied, and by passing the finger into the abdominal cavity to investigate the parts in the vicinity of the internal ring, a measure which should be insisted upon in all operations for strangulated hernia. The symptoms of obstruction are said to be often insidious in development and less severe than in an ordinary strangulated hernia. Sometimes the patient states that there is a feeling of incomplete reduction even after the outer hernia has been replaced, in other cases severe pain follows, particularly if the testis is in the inguinal canal.

Of the *femoral variety* only 10 cases are recorded, all in women. In but two of these was the inner sac discovered as a tumor before operation. Seven were strangulated.

The *diagnosis* of properitoneal hernia is seldom made before operation, and sometimes not even at operation. The following features should lead one to suspect this condition: An irreducible external hernia in an adult, with a tympanitic tumor above Poupart's ligament which increases in size when pressure is made on the outer sac, and *vice versa*; maldescent or late descent of the testes, particularly the right; long duration of the hernia; the feeling of incomplete reduction which the patient may have previously experienced, hence failure of truss treatment; and the mild character of the obstructive symptoms.

While before 1880 all cases ended fatally the mortality at the present time is in the neighborhood of 34 per cent.

Several theories have been advanced to explain the formation of a properitoneal hernia. (1) The neck of an external hernia is displaced upwards and forms a diverticulum, as the result of narrowing of the mouth of the sac, which hinders reduction of the contents. The same result follows conditions which, while narrowing or closing the external ring, do not prevent the entrance of the hernia into the canal, *e.g.*, badly fitting truss, maldescended testicle, etc., and traction on the neck of the sac by adherent

omentum or bowel. (2) Reduction in mass. (3) A congenital deformity of the vaginal process. (4) A properitoneal sac is formed first, perhaps by traction of a mass of fat or accentuation of a peritoneal fossa, the external hernia developing secondarily.

HERNIA INTO THE RETROCOLIC FOSSA.

DR. STEWART reported the history of a man, aged 86 years, who was subjected to a suprapubic prostatectomy in April, 1896. Three days later he complained of abdominal cramps after the administration of calomel. After a copious bowel movement the pain became steady and localized itself in the right iliac fossa, in which region palpation disclosed tenderness and slight muscular rigidity. The following day the bowels moved again and the pain had disappeared, although there was hiccupping and slight distention, both of which increased during the next 24 hours, during which time another bowel movement was reported. The pulse, temperature, and respirations were normal and there was no vomiting. On the fourth day from the onset of pain the patient suddenly vomited a large quantity of dark, foul-smelling fluid and died quickly thereafter.

A limited and hurried autopsy showed that a loop of the lower ileum had passed up behind the cæcum into a cavity about 4 inches in diameter. The anterior wall of this cavity was formed by the cæcum, the posterior by parietal peritoneum, the outer or right by a fold of peritoneum passing from the cæcum to the posterior abdominal wall, and the inner or left by a similar fold of peritoneum. The mouth easily admitted two fingers. The appendix with its mesentery was situated to the front and left, stretched over the neck of the sac. The bowel was not gangrenous, but a well-marked furrow could be seen at the point of constriction.

The retrocolic or retrocæcal fossa, according to Moynihan ("Retroperitoneal Hernia," London, 1899), is determined by two peritoneal folds, an outer and upper, and a lower and inner. The former, or parietocolic fold, called also right or superior ligament of the cæcum, is triangular in shape, the posterior border being attached to the abdominal wall from the lower pole of the kidney or higher to the iliac fossa, the anterior or internal to the postero-external aspect of the colon and sometimes the cæcum, and the lower or free border extending from the intestine to the iliac fossa. The lower and inner, or mesentericoparietal fold,

called also inferior ligament of the cæcum, is in reality the insertion of the enteric mesentery into the iliac fossa. It too is triangular in form, the base being inserted into the iliac fossa at about the point where the spermatic vessels cross the external iliac arteries; the intestinal border, into the small intestine and postero-internal aspect of the cæcum and ascending colon; and its free edge, concave, looking downwards and to the right. The fossa is bounded in front by the posterior surface of the ascending colon and sometimes by that of the cæcum, and behind by the parietal peritoneum. Its orifice looks downwards, and will not infrequently admit the index finger.

Moynihan mentions 11 cases which have been looked upon as hernia into the retrocolic fossa and rejects all but two. This form of hernia is so rare, according Treitz, because its orifice looks downwards, and therefore the intrusion of the gut is to some extent prohibited by gravity, and because the orifice of the sac is not resistant, and does not contain any vessel. These remarks do not apply to the vermiform appendix, which is not infrequently found in the retrocolic fossa. In some of these cases the appendix is described as lying between the layers of the mesocolon or behind the peritoneum, and it is in such cases that an inexperienced operator may fail to find the organ.

FRACTURES OF THE PELVIS.

DR. HENRY R. WHARTON reported three cases of fracture of the pelvis, as follows:

CASE I.—Man, aged 34 years, a locomotive fireman, was admitted to the Presbyterian Hospital May 5, 1908, having been caught between the tender of a locomotive and a water tank. On admission he was suffering from shock, contusion of the back, and tenderness over the lower portion of the abdomen. There was some bleeding from the urethra. A rubber catheter introduced into the urethra withdrew several drachms of blood, and the catheter could not be introduced into the bladder. A metal catheter was then passed and drew clear urine. The following day the patient complained of pain over the lower portion of the abdomen, and there was some discoloration of the skin over the perineum and posterior portion of the scrotum; the patient was able to pass his urine, which was slightly tinged with blood.

There was some rigidity over the lower portion of the abdomen. The patient's condition remained the same for some days, and repeated examinations failed to elicit any symptoms of fracture of the pelvis. An X-ray examination was made with a negative result.

The patient, ten days after admission, still complained of tenderness on pressure over the pubis, and a mass three inches in diameter could be demonstrated in this region. About this time there was a moderate elevation in his temperature, and there was a decided leucocytosis.

On June 2 a small abscess developed upon the upper left side of the perineum, which was incised. As the patient's condition was not improving, and the mass over the pubes was still tender upon pressure, it was decided that this should be incised. An incision in the median line, two inches in length, one and a half inches above the pubis, opened an abscess which contained several ounces of broken-down blood-clot and offensive pus. Exploration of this cavity with the finger revealed a fracture of the horizontal ramus of the pubes, with the fragments in good position, and the sinus resulting from the abscess previously opened was found to communicate with the abscess cavity. A week after the suprapubic opening had been made urine began to escape from this opening. An X-ray examination made at this time showed a fracture of the pubic bone on the left side. The patient did not improve in spite of the free drainage, the temperature became more elevated, and he developed marked septic symptoms; and he died on July 22.

In this case injury of the bony pelvis was not suspected, as the symptoms pointed to a contusion of the lower abdomen, with the formation of a blood-clot above the pubes, and it was only when this had become infected, and abscess had formed, that the true nature of the injury was disclosed. It is possible in this case that earlier operative interference might have averted the fatal issue.

CASE II.—Man, aged 25 years, a moulder employed in a steel mill, was struck upon the pelvis by a flask weighing about 1000 pounds, which produced a fracture of the pubes and a lacerated wound of the perineum, from which there was free bleeding. He was brought to the Presbyterian Hospital May 26, 1906, ten hours

after the accident, when examination showed that there was a fracture of the pubis involving the left side, a lacerated wound of the perineum which exposed the anterior wall of the rectum for a considerable distance; the abdomen was moderately distended, and the bladder was also markedly distended; a small amount of blood-stained urine escaped from the perineal wound.

The patient was etherized, and exploration of the perineal wound with the finger showed that it extended to the base of the bladder; a fracture of the pubes, with some displacement of the fragments, could also be demonstrated. It was found impossible to pass a catheter into the bladder through the penis or through the perineal wound. It was then decided to open the bladder above the pubis and attempt a retrograde catheterization. This was done, a catheter was passed through the bladder into the urethra and secured in this position, and the suprapubic wound was closed. Drainage was also introduced into the perineal wound. The suprapubic wound opened and discharged urine in a few days, and free purulent discharge occurred from the perineal wound for several weeks, which was accompanied by marked febrile disturbance, but at the end of three weeks the bladder drainage was removed, and at this time he voided urine partly through the urethra, the suprapubic opening, and the perineal wound. A sound was passed each day through the urethra into the bladder, and the leakage of urine from the perineum gradually ceased. The suprapubic and perineal wounds gradually healed, and he was able to pass the urine freely by the urethra, and was discharged from the hospital on August 25, 1906, in good condition.

He was advised to continue the passage of the sound at intervals, and when last seen, a year after the accident, he was in good health, and had no difficulty in passing urine, but was still passing the sound at intervals.

CASE III.—Boy, aged 12 years, was run over by an ice wagon loaded with 1800 pounds of ice, the wheels passing obliquely over the pelvis from left to right. He was admitted to the Presbyterian Hospital July 14, 1908, a few minutes after the accident, and exhibited the symptoms of shock in a most marked degree. Examination revealed a lacerated wound, exposing the abdominal muscles three inches to the right of the umbilicus; also an abrasion

of the upper part of the left thigh, 4 inches by 6 inches, with several other less serious abrasions. Examination also revealed separation of the left sacro-iliac joint, and a marked separation of the pubic bones at the symphysis; the right leg was abducted and showed apparent lengthening. A catheter passed into the bladder drew clear urine. Examination of the rectum showed no blood, so that it was concluded that these viscera had escaped injury. X-ray examination showed that the injury to the pelvic bones was very extensive, consisting of the marked separation of the left sacro-iliac joint, complete separation of the pubic bones with downward displacement, and a fracture through the right iliac bones just above the acetabulum.

The patient was actively treated for the condition of shock, the wounds and abrasions were dressed, and a firm muslin binder was applied around the pelvis and was reinforced by broad straps of adhesive plaster.

The patient gradually reacted from the condition of shock, and as soon as the condition of the wounds would permit, a plaster-of-Paris bandage, including the pelvis and upper portion of each thigh, was applied.

The patient made an uninterrupted recovery and was discharged from the hospital August 18, 1908, but was kept in his bed at home, with the plaster-of-Paris bandage in position, for a month subsequently. The reporter has been informed that the boy is now able to walk without difficulty and is in good condition. The remarkable feature in this case was the extensive damage to the pelvic bones without damage to the pelvic viscera.

LARGE GALL-STONE REMOVED FROM THE COMMON DUCT.

DR. WHARTON reported the history of a man, aged 56 years, who was admitted to the Presbyterian Hospital with the history that he had suffered for the last few years with recurrent attacks of pain in the epigastrium, and jaundice. At the time of his admission he was very markedly jaundiced, and complained of pain on pressure over the gall-bladder. His temperature was elevated and there was tenderness on pressure over the gall-bladder.

The gall-bladder was exposed and opened, and contained several ounces of pus and two gall-stones. The region of the common duct was explored, but no stone could be felt. The gall-

bladder was drained, and the patient's general condition improved, and the jaundice disappeared. The sinus leading to the gall-bladder still continued to discharge a large quantity of bile. He left the hospital some weeks after the operation with the sinus still discharging a large quantity of bile.

He returned a short time ago, stating that the bile still continued to escape freely from the sinus. His general health at this time was good. Upon opening the abdomen the common duct was found to be obstructed by a large stone, which was removed and the duct drained. The common duct in this case seemed to occupy a much lower position in the abdomen than is usual, possibly being dragged downward by the weight of the contained stone, which may account for the fact that it was not discerned at the first operation. The patient made a rapid recovery, the wound being entirely healed in three weeks.

DR. JOHN B. DEEVER said that this stone presented by Dr. Wharton was a particularly large one. He had extracted as large stones, and in a few instances larger ones, but they are very unusual. That very day he had operated on a physician, 77 years of age, whom he had had under his care before. He was first operated upon some six years ago, when he had a larger stone in the common duct than the one shown by Dr. Wharton. He had a choleduodenostomy formed by nature which explained the absence of jaundice. There was no difficulty in removing the stone, but a good deal in dealing with the gall-bladder. He made an uneventful recovery. A year later he came back with a forming abscess in the region of the field of operation, which was opened and drained and he went home well. Later he reported that he had slight jaundice with renewed symptoms of stone in the common duct. At the operation that day he was found to have three stones in his common duct and two stones in the right hepatic duct; one of the stones in the hepatic duct was removed without difficulty; the second, as it could be felt with the finger but could not be delivered, was broken up until the gall-stone scoop could be passed well into the hepatic duct, which so far as could be seen was clear. The stones in the common duct were not as large as this of Dr. Wharton's, but were of good size. Those in the right hepatic duct were smaller.

Now the lesson he had learned from this, as well as from other cases of this kind, is, never to do a cholecystectomy when a

cholecystostomy will suffice. One of the reasons why the gall-bladder should not be removed, from a physiological standpoint, is that if the patient is the subject of subsequent stone formation, the stones will form in the common or hepatic ducts, while if the gall-bladder had been left they would more than likely have formed in it. The hepatic duct stones in the case now reported formed because the common duct was practically filled by the three large stones. He was pretty sure that he did not miss these stones in his first operation, because he had the common duct wide open; therefore he believed these stones to be a subsequent formation. However he had had the same experience as Dr. Wharton, that of opening the gall-bladder and failing to find the stone, and then finding it subsequently.

GOITRE AS AFFECTED BY THE X-RAY.

DR. WILLIAM J. TAYLOR reported the history of a young girl, aged 15 years, who had a goitre involving both lobes of the thyroid, which was not large, but was distinct and at times interfered somewhat with her breathing. In view of her age and the small size of the growth, and because her mother was much opposed to any operation, the use of the X-ray was advised.

She therefore went to Dr. S. Mason McCollin quite frequently from the middle of January, 1905, to June of that same year, for treatment by the X-ray. Under its influence the circumference of the neck diminished one and one-half inches, that is from thirteen and one-half to twelve inches. An extraordinary chain of symptoms, however, developed. After the exposures had been continued for this length of time, and coincident with the diminution in the size of the goitre, she became very nervous, her eyes prominent, her heart action very rapid, and she presented all of the symptoms of exophthalmic goitre. As soon as the exposures to the X-ray were stopped all these symptoms subsided, and while there was no increase in the growth of the thyroid, her general condition was very much improved.

That the X-ray is powerful in its action is undoubted; and the peculiar behavior of this growth, simulating so closely the symptoms of an overdose of thyroid secretion, would tend very much toward confirming the theory that exophthalmic goitre is due to an excess or systemic poisoning by this secretion. It is known that the X-ray produces an overgrowth of fibrous tis-

sue and a gradual contraction of all glandular tissue. Is it not possible that the long continued use of the X-ray squeezed the thyroid and thus produced systemic poisoning from the secretion?

DR. C. L. LEONARD (by invitation) remarked that he had had under treatment cases which exhibited not so marked symptoms of Graves's disease, since they resulted from overdosage and carrying the treatment too far. In his first case, the goitre disappeared, but the treatment was carried too far and the patient had temporary disturbance in the gait and unsteadiness, which has now been entirely recovered from. That was over four years ago, and the patient is now in perfect health. In the second case treated four years ago, in a young girl of 18, the treatment was suspended before the goitre disappeared completely in order not to carry it too far. Six months later the continued effect of the treatment was shown in the complete reduction of the growth. He had had another case of simple goitre in which treatment was stopped about six months since. The patient is now perfectly free from any symptoms or signs of goitre. But the most remarkable effects he had seen had been in the forms of exophthalmic goitre. One patient had all the symptoms of exophthalmic goitre, with the exception of exophthalmos. She recovered completely from all the symptoms of Graves's disease. When asked if she had any more trouble with her heart, she said, only when she ran for trolley cars! Dr. Leonard had seen in the Liverpool Hospital cases of exophthalmic goitre which were most remarkable, the patients having been referred for treatment in the last stages of the disease, when they were completely bedridden. They recovered to such a degree that they were about the wards but were not fully recovered at the time he saw them, although markedly improved, their charts showing a rapid decrease in the symptoms and pulse rate. The remarkable results achieved by Röntgen treatment are the more remarkable since these patients are only referred for treatment when the disease is far advanced. The case reported is only an evidence of the efficiency of this treatment and a warning that the treatment must not be carried too far or, as in the older complete operations, the total removal or destruction of the gland will produce grave symptoms.

DR. JOHN B. DEEVER said that he could not see the philosophy of treating simple goitre with the X-ray, because the surgical treatment is so brilliant and satisfactory. Dr. Taylor's patient

objected to operation. In the case of exophthalmic goitre it may have a field. His recent experience, since he had given up the removal of the cervical ganglia of the sympathetic nerve, had been satisfactory. He now confined the patient to bed for several days before operation, gave Beebe serum, ligated one or more of the thyroid arteries, and later removed half of the gland. His results are now so good that he would hesitate about advising X-ray treatment until it was demonstrated to be more beneficial. Where the X-ray has been applied for any length of time it makes the dissection more difficult, another thing which would make him hesitate to use it. He had used the X-ray for the purpose of thickening the capsule but latterly had given this up.

DR. WILLIAM J. TAYLOR said that he had purposely said nothing about exophthalmic goitre in his report, as this case was one of true goitre, and not Graves's disease. The patient was a healthy, bright, strong, lusty girl of 15. She had no tachycardia, no symptoms whatever except that the goitre produced a little pressure on her trachea and gave her some dyspnoea on exertion. The question of treatment of exophthalmic goitre by the X-ray of course is a very different subject, and one to be gone into with a great deal of elaboration. The results of any form of treatment of exophthalmic goitre are to his mind somewhat doubtful, as he had seen a number get well if kept in bed. Many cases come to the Orthopædic Hospital and Infirmary for Nervous Diseases, are put to bed on a rest treatment, are built up, and get entirely well in a short time. If the X-ray was used they would say the X-ray had produced that result. He would not say that the X-ray will not produce good results, as he had not had any experience with them. Personally, he should feel very anxious about the use of the X-ray in an exophthalmic goitre case, because if one squeezes still more of the secretions into the individual a more profound intoxication is produced. The operative results in the very persistent exophthalmic cases are so very good that personally he was inclined toward the operative treatment rather than the X-ray. He agreed with Dr. Deaver in the statement that the X-ray produces a change in the tissues and makes dissection much more difficult. This is demonstrated very effectually in cases of glandular disease of the neck. Several times he has been unfortunate enough to be compelled to operate after X-rays had been used, and at times it was almost impossible to tell one tissue from

another, and where one could ordinarily use a blunt dissector a knife or scissors is required.

Some of these patients at the Orthopædic Hospital have remained well, and personally he would not consent to operate on cases of exophthalmic goitre without a preliminary trial of the rest treatment. Some, of course, will get progressively worse in bed. One of the cases upon which he operated for Dr. Mitchell, some four or five years ago, was in bed for months; every possible means was tried to help him, and standing by this man's bed you could see the mattress shake. He removed his thyroid, first attempting it without an anæsthetic, but he was so agitated that chloroform had to be given to complete the operation. The next morning he was really hollow-eyed; he was better than for weeks, and eventually made a good recovery.

One of the essential points in operation in exophthalmic goitre is drainage. In any case of exophthalmic goitre in which any portion of it is removed it is absolutely necessary to provide largely for drainage, otherwise there will be a still further intoxication.

BOOK REVIEWS.

ABDOMINAL TUBERCULOSIS. By ERNEST MAYLARD, M.B., B.S. (Lond.), Surgeon to the Victoria Infirmary, Glasgow; Late Examiner in Surgery to the University of Glasgow, and to Victoria University, Manchester; Formerly Demonstrator of Anatomy, Guy's Hospital, London. Octavo, 360 pages. J. & A. Churchill, Publishers, London, 1908.

In the preface of this work, the author calls attention to the wide-spread interest in the general subject of tuberculosis, and since the recent International Congress the timeliness of its appearance is even more manifest. The volume is divided into sections dealing with the abdominal viscera in their logical anatomical sequence, and naturally a large proportion of it is devoted to the gastro-intestinal tract and the female reproductive organs. One would hardly expect in such a book originality either of opinion, research, or conclusions; indeed on many of the moot points, as the question of bovine tuberculosis and the value of opsonic vaccination, the writer simply states the various facts or theories and leaves the reader to his own deductions. But for one who takes the book simply for what it evidently purports to be—a summary of clinical and pathological experience—there is an accumulation of very interesting and valuable facts. The pathology of the subject receives a preponderance of attention, and one of the most marked characteristics of the work is the large number of excellent illustrations of pathological specimens and abstracts of pathological reports.

The handling of therapeutic questions, while not as extensive or authoritative as a fuller use of statistics would render it, is eminently sane and logical. That Mr. Maylard is not biased in favor of his own specialty is shown by his constant insistence upon the importance of medical procedures in conjunction with purely surgical measures. So fully has he realized the necessity for laying emphasis upon this point, that there is appended a separate chapter upon the non-surgical methods of treating tuberculosis, by Dr. Walter K. Hunter, Physician to the Royal Infirmary, Glasgow.

The book is very thoroughly indexed, contains an extensive bibliography, and as above noted is exceptionally well illustrated, from a pathological view-point.

HARVEY B. STONE.

A TEXT-BOOK OF SURGICAL ANATOMY. By WILLIAM FRANCIS CAMPBELL, M.D., Professor of Anatomy, Long Island College Hospital; Attending Surgeon to the Methodist Hospital, etc., Brooklyn, N. Y. Octavo, 675 pages; with 319 original illustrations. Philadelphia and London, W. B. Saunders Company, 1908.

Many attempts have been made by various writers to so sugar-coat the pill of anatomy that it may be readily swallowed and, at the same time, give to the recipient the same benefit that would be derived from the old-time and less palatable preparations. The present work by Dr. Campbell has been, in a great measure, successful in attaining this end. In addition to being the head of the department of anatomy in the Long Island College Hospital the author is also an attending surgeon at three of the hospitals of the City of Brooklyn. He has thus been able to present both the essential facts of anatomy and a large number of practical suggestions for the surgeon.

The book is divided into six parts, concerned with the discussion of the head and neck, the thorax, the upper extremity, the abdomen and pelvis, the spine, and the lower extremity.

A general plan has been followed with each of these parts. The initial chapter is devoted to a detailed description of surface anatomy, illustrated by a large number of original plates. If the medical student or physician should take each of these initial chapters in order to mark out, either upon himself or upon some patient, the various anatomical landmarks described, such a demonstration would in itself be a valuable review of many of the most important subjects of anatomy. Then follow the chapters devoted to the surgical anatomy of each of the minor divisions of the region under discussion. Thus, in Part I, are considered in detail the scalp, the bony vault of the cranium, the cranial contents, the ear, the face, the cervical region, the nose and nasal cavities, the mouth, the teeth and pharynx, and the neck. No attempt is made to introduce every anatomical detail, but the essentials are clearly described and in connection with each part there are given many practical rules for the guidance

of the surgeon. Those practitioners who devote their time to the eye, the ear, the throat, or the nose, exclusively, will find in this volume, in a condensed form, an excellent summary of their own specialty and much that is new in the way of surgical technic.

These chapters, too, will prove of special value to those who are obliged to rely upon themselves alone for the treatment of all varieties of surgical lesions, and who may be called upon to rectify strabismus, to remove deflected turbinates, or to trephine for mastoid disease.

In a similar way the other parts of the book are subdivided. In the chapter upon the thorax, the female breast with its cancerous conditions is described especially well, and the best methods of operation are clearly indicated. In the consideration of the upper and lower extremities dislocations are described in a concise and masterly way and the illustrations showing the varieties of dislocations of the shoulder, of the elbow, of the thigh and of the knee are worthy of especial mention. In connection with these the best methods of reduction are given and emphasis is laid upon the anatomical reasons which must form the basis for any such procedures. Fractures of the long bones are equally well described.

The portion of the book devoted to the consideration of the abdomen and pelvis is of equal importance and the surgeon called upon to treat hernia, appendicitis, diseases of the gall-bladder, wounds or new growths of the abdominal viscera, and to perform those varieties of surgical operations which involve the genito-urinary apparatus of the male or of the female will here be able to refresh his knowledge of anatomy and at the same time will find a brief description of all well-recognized operations for the relief of these conditions.

The book is written in a colloquial style and the author has succeeded in presenting his subject in such a way that it is both instructive and readable. It will prove of value to the medical student as an aid to correlate the facts of anatomy and of surgery in preparation for the ordeal of examinations. Still more the active practitioner will find here a mine of information which he may work upon in his spare moments and derive from the work both profit and pleasure.

The illustrations by Deck that accompany the text are

numerous and original and are eminently practical. The subjects themselves in many instances are new and are the outcome of the author's work as an anatomist and a surgeon. They add greatly to the value of the book. HENRY P. DE FOREST.

TRAITÉ DES MALADIES DES VOIES URINAIRES. Par E. DESNOS et H. MINET. Avec 289 figures dans le texte et huit planches en couleurs hors texte; pp. 1093. Paris Octave Doin et Fils

This very valuable work is an eloquent testimonial of the present-day position of genito-urinary surgery in France. Both by intent and practice it emphasizes the great authority of the *Maître* Guyon and the achievement of his loyal disciples of the Necker school.

It is a model book, written with the utmost care and with a keen appreciation of the needs of the average reader. Certain of its features are quite unique, particularly the detailed descriptions of technical procedures.

All forms of treatment recommended show evidences of sound and dispassionate judgment; freakish or hazardous procedures are discouraged.

The work is well balanced, every section being given its due weight according to its importance. Treatment is not allowed to overshadow pathology, and *vice versa*. Foreign authors and their methods are liberally quoted and American efforts in this line of work have been recognized. This statement applies more particularly to the present generation, the work of Bigelow and Otis for instance receive scant attention.

If any criticism can be made it would deprecate giving as much attention as it does to justly obsolete procedures such as castration or Bottini's operation for enlarged prostate.

The illustrations, which are refreshingly original, are well done and convince one that they are designed really for explanation and not for padding.

Each chapter is headed with a short bibliography selected most judiciously for the further direction of those wishing to pursue any subject to a greater extent. C. L. GIBSON.

GYNÆCOLOGY AND ABDOMINAL SURGERY. In two volumes. Edited by HOWARD A. KELLY, M.D., Professor of Gynæcologic Surgery at Johns Hopkins University; and CHARLES P. NOBLE,

M.D., Clinical Professor of Gynæcology at the Woman's Medical College, Philadelphia. Large octavo volume of 862 pages, with 475 original illustrations by Mr. Hermann Becker and Mr. Max Broedel. Philadelphia and London, W. B. Saunders Company, 1908.

The gynæcologist, gradually extending his field, has included the bladder, the appendix, the ureter and the kidney, and has found that the technic, in general, of performing an operation upon the uterus differed in no way from that of an operation upon the kidney. The method of entering the abdomen is the same, the peritoneum covering the viscera in the upper abdomen and in the lower abdomen is the same, and, in fact, there has never been any good reason why a man versed in gynæcological surgery should not be competent to treat surgical diseases of the rest of the abdominal cavity; and, *vice versa*, a man proficient in general abdominal work is quite competent to deal with pelvic conditions. This is the first work in which the two subjects are prominently treated to the exclusion of the surgery of the rest of the body. It shows the gradual acceptance of the claims of surgeons to be able to remove a uterus or repair a perineum as well as the man who, beginning as an obstetrician, gradually aspires to general surgery.

The first volume of this work has been fully reviewed in an earlier number of the ANNALS OF SURGERY. This second volume contains many important chapters. The question of operation during pregnancy is discussed by Richard C. Norris. In appendicitis, he emphasizes the importance of early diagnosis and operation before abscess formation, and the prevailing opinion is that operation offers the best results for mother and foetus. The same is true of cholecystitis. In the case of fibroid tumors of the uterus complicating pregnancy, the rule is laid down to allow the pregnancy to continue as long as urgent symptoms are absent, and to operate on obstructive cases a few days before term. In cases of pyelitis, he states that distinct enlargement of the kidney or its pelvis always calls for interference, advice which certainly is too heroic, since many cases even in this stage are relieved by appropriate treatment. The chapter is far too short to do justice to so important a subject.

Extra-uterine pregnancy is ably considered by J. Whitridge

Williams. Ovarian and tubal pregnancy are discussed at length, but the author does not recognize the existence of abdominal pregnancy as of primary occurrence. He insists on the importance of immediate operation as soon as an extra-uterine pregnancy has been diagnosticated, the abdominal route being preferred. Many surgeons do not agree with this teaching, but it would seem that the weight of statistics is in favor of immediate operation. An extensive bibliography is given.

One of the most important and scholarly chapters is that written by J. C. Bloodgood on diseases of the female breast. Dr. Bloodgood combines the qualities of a surgeon of wide experience and a surgical pathologist with unlimited material. His contribution is based upon a clinical and pathologic study of 1048 lesions of the female breast which have been observed in the Surgical Pathologic Laboratory of the Johns Hopkins Hospital and University. The problem in the treatment of every lesion of the female breast is the early recognition of carcinoma and its radical removal. He considers a tumor in a woman under twenty-five, benign until it is proved malignant; and, on the other hand, every single tumor in the breast of a woman over twenty-five should be considered malignant until it is proved to be benign. Every phase of the subject has been considered, and the illustrations are especially fine. The chapter is in itself a classic.

Still other important chapters on abdominal surgery are presented by Ochsner, Moynihan, Finney, Murphy, Kelly, Opie, and Noble.

The book is a very notable contribution to surgery and deserves the highest praise.

PAUL M. PILCHER.

SURGERY: ITS PRINCIPLES AND PRACTICE. In five volumes.

Edited by W. W. KEEN, M.D., LL.D., Hon. F.R.C.S., Eng and Edin., Emeritus Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Phila. Volume IV. Octavo of 1194 pages, with 562 text-illustrations and 9 colored plates. Philadelphia and London: W. B. Saunders Company, 1908.

The fourth volume of the *Encyclopædia of Surgery*, edited by Dr. Keen, is now before us. The chief topics of the present

volume are surgery of the intestines, including hernia, and surgery of the genito-urinary organs. Further chapters in the volume are devoted to the eye and ear and to military, naval, and tropical surgery.

The volumes that compose this monumental work have appeared with regularity since the issue of the first volume, which was reviewed in the *ANNALS OF SURGERY* for January, 1907. Each volume has justified the claims made in the first announcement, that the book would represent the best surgical practice of to-day; and such is eminently true of the present volume, as will be appreciated when we say that the article on "Hernia" is written by William B. Coley; that on "Surgery of the Rectum," by Robert Abbé; that on "Surgery of the Kidney," by Joseph Ransohoff; that on "Stone in the Bladder," by A. T. Cabot; that on "Surgery of the Prostate," by Hugh H. Young; and that on the "Appendix Vermiformis," by John B. Murphy. The other chapters also come from the pens of men of the highest attainments in the respective fields assigned to them.

The character of the illustrations is worthy of special notice; they are numerous and represent the best type of the illustrative art of the present day, and, with rare exceptions, they really illustrate. Special notice may be made of the colored plates which illustrate the article on the "Surgery of the Kidney."

We congratulate the veteran author upon a most satisfactory working out of his plans for what must be the *chef d'œuvre* of a long and eminent career as a teacher and operator. One volume alone now remains to complete the series.

CONSTIPATION AND INTESTINAL OBSTRUCTION. By SAMUEL GOODWIN GANT, M.D., LL.D., Professor of Diseases of the Rectum and Anus, New York Post Graduate Medical School and Hospital. 540 pages, 250 illustrations. W. B. Saunders Co., Philadelphia and London, 1909.

The author has endeavored to present to the profession a practical treatise on the etiology, pathology, symptoms, and treatment of constipation and obstipation. The first half of the work is utilized in the presentation of the educational, prophylactic, psychic, dietetic, physical, and medicinal treatment of chronic constipation. Then follows the consideration of the complications

and consequences of constipation, spastic and acute constipation, and that of infants and children. The surgical treatment then receives extended attention, and the various intestinal operations which have lately come into vogue are considered at length. The last few chapters give a review of the present-day conception and treatment of splanchnoptosis.

Continued reiteration is made of the fact that the author is opposed to the use of drugs in any form, except occasionally when they are administered merely symptomatically; but for the advocates of the management of constipation by medicine he has introduced two chapters which have been devoted to its consideration. Indications for the various classes of remedies are taken up in one, and the other contains a fairly complete formulary of the favorite prescriptions by prominent men.

Thus, as one might expect, emphasis is laid on the manifold benefits to be derived from psychotherapy, diet, and physical measures. The last are particularly to be remarked; and we find fully considered the various bodily movements, the many methods of massage, the multitude of baths, rubs, douches, compresses and packs, and the latter-day apparatus for mechanical vibration, together with the different methods of administering electricity.

The extensive chapter on the treatment of gastro-, hepato-, spleno- and nephroptosis, seems to the writer to be hardly relevant to the subject at hand, but is very interesting.

The book is well written and its subject matter instructive. The illustrations, which are original, are reproduced with remarkable clearness. Many of the suggestions of the author, however, will, I fear, have to be foregone by the majority of practitioners, as the facilities for carrying them out can only be found in the larger cities. There are, however, many valuable methods of procedure which one can glean from it, so that both from a literary and scientific point of view it is to be commended.

CORRESPONDENCE.

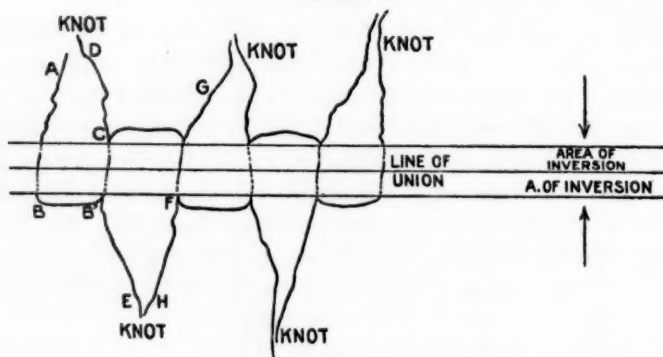
I. AN INTERLOCKING SUTURE.

EDITOR ANNALS OF SURGERY:

Permit me to report a suture similar to the one described by Dr. Turck in the ANNALS OF SURGERY for December, 1908. This was devised and used by me, and if it has been used by others I am not aware of it.

A needle is used with two eyes placed near together at the end. One eye, No. 1, is threaded with suture A, and the needle is

FIG. 1.



An interlocking suture.

passed through the two edges to be brought together, in the Lembert fashion, and out at B (see Fig. 1). Here eye No. 2 is threaded with another suture, and the two are carried back by the needle through the tissues as before, emerging at C. Unthread eye No. 1, and we have the free suture end D, and also E that was left behind (long). Now rethread eye No. 1 with a new suture and pass the two again through the tissues to F, leaving behind as before the free end G. Unthread eye No. 2, leaving H free. Proceed thus to the end of the suture line.

Before tying A to D and E to H, etc., see that D has been passed from within outward, beneath the loop at C, and the same for E at B'. This insures usually the locking of the sutures (all being so passed) and prevents strain on and opening of the stitch holes.

The same advantages are claimed for this as for other kinds of interlocking sutures, with the additional ones of simplicity and easy application, and the important fact of about half as many needle holes made. In the above-mentioned article (of Dr. Turck) the locking sutures are close together and the small amount of tissue between may often be strangulated.

This suture that I have attempted to describe is particularly useful in operations on the urinary and gall-bladders, the ureters, gall-ducts, intestines, stomach, etc., where absolute and accurate closure is the first requisite.

FRANK SUGGS, M.D.,
First Lieut. Med. Res. Corps, U. S. Army.

II. HARE-LIP TRACTION ABSORBER.

EDITOR ANNALS OF SURGERY:

In the January number of the ANNALS OF SURGERY, on pages 51 and 55, Dr. Joseph R. Eastman referred to one of my hare-lip appliances in the legend to Fig. 33, opposite page 51, as a "relaxation absorber"; and in the text on page 55, line 4, as a "tension absorber." The device is really a "traction absorber" and should be so characterized.

It is applied immediately after the last suture is made in any hare-lip operation; it is efficient in relieving or absorbing all traction on the sutures; it will hold together the raw edges of the wound without any sutures; the wound is at all times readily accessible for changing dressings or for inspection; it does not in any way interfere with breathing, or with opening or closing the mouth; it is held in place by adhesive plaster remote from the wound; its tension is easily increased.

Very truly,

H. R. ALLEN, M.D.,
Indianapolis, Indiana.

III. TECHNIC OF TYING OFF THE MESENTERY IN DOING A RESECTION OF INTESTINE.

EDITOR ANNALS OF SURGERY:

Having been hampered in point of time and accuracy in placing ligatures in the mesentery during intestinal resection, and deploring the amount of undue handling of the gut and its attachments necessitated by many methods advocated, I have instituted the following mode, which I can recommend as being at once easy of execution and surgically accurate.

The mesentery is put on the stretch by an assistant, and the apex of the V-shaped wedge to be removed is pierced by a clamp or some other carrier and two long strands of gut or silk are drawn through.

The two ends of one strand are now threaded on two bodkins and the operator proceeds, as the shoemaker with his awl, to pierce the mesentery from each side through a single opening and draw opposite ends of the ligature through; a single tie is made and the process repeated at one- or two-inch intervals along the limb of the V till the gut is reached. The opposite limb of the V is now dealt with in the same way and the section removed.

The ends having been left long a round needle is now substituted for the bodkin and the mesenteric edges sutured together; this is repeated on the opposite side and the limbs of the V approximated in like manner.

One will at once see that a continuous figure-of-8 is procured, and that there has been no possibility of omitting a single vessel from the ligature.

Where time, always important, is paramount, the tie at each segment may be omitted, as the whole, after being laid, may be drawn taut and tied at the distal end of each limb of the V.

The advantages derived are: (1) The apex of the V is a single point and the limbs are straight lines; (2) the accuracy with which the ligature may be laid and the insurance of but a single puncture for each segment of mesentery; (3) the rapidity with which it may be laid; (4) that it reduces the amount of handling of the gut and mesentery to a minimum; (5) the obviation of the necessity of clamps, which, though padded and in skilful hands, must produce more or less contusion and laceration of these delicate tissues.

C. S. VENABLE, San Antonio, Texas.

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